

# Report of the Ad-hoc Committee in Connection with the Investigations of the River-Valley Projects

सक्यपंच जयन

GOVERNMENT OF INDIA
MINISTRY OF WORKS, MINES AND POWER

# REPORT OF THE AD-HOC COMMITTEE

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REPORT OF THE AD-HOC COMMITTEE, APPOINTED BY THE GOVERNMENT OF INDIA/IN THE MINISTRY OF WORKS, MINES AND POWER, IN CONNECTION WITH THE INVESTIGATIONS OF THE RIVER-VALLEY PROJECTS, PREPARED BY THE CENTRAL WATERPOWER, IRRIGATION, AND NAVIGATION COMMISSION.

"We, the members of the Ad-hoc Committee met on 11th May 1948, and again on 18th May 1948, to examine the projects and estimates prepared by CWINC in connection with the Kosi, Narbada, Tapti, Sabarmati, C. P. and Berar rivers, Bastar State rivers, Assam Valley, and Coorg, in accordance with the terms of reference at Appendix I, page 9.

Messrs. Man Singh, Member, M. D. Mithal, Director, and G. N. Pandit and K. M. Bhatia, Project Officers, presented the proposals and explained the various features of the proposed developments.

They recast the relevant estimates in the light of some modification proposed during the first day's meeting.

# Item I of the Terms of Reference

I. What would you consider to be reasonable cost of investigations of a project in relation to the overall capital cost of that project?

As to the reasonable ratio which the cost of investigations of a project should bear to the overall cost of the project, in our opinion, no hard an first figure can be laid down. Generally speaking, the cost of prelimitary investigations will not be less than one per cent of the overall capital cost. It may go up as high as five per cent depending on the nature and features of the project.

#### 1. KOSI PROJECT

# (APPENDIX II)

# Items II to VI of the Terms of Reference

- II. Are the proposals in respect of each one of the above projects, as put forward by CWINC, in order?
  - III. Is the cost of investigations, provided in the above proposals, justified?
- IV. Keeping in mind the proposed programme and priorities of investigations, is the proposed strength of engineering staff, provided in the estimates for the purpose, adequate?
- V. Is it possible, by a re-arrangement of programme, or priorities, to reduce expenditure, or at least spread it over a longer period, in respect of one or more of the projects?

The proposals in respect of investigations of the Kosi project, as put forward by CWINC, are in order.

The provision of Rs. 65 lakhs for investigations while adequate for the period in question appears to be on the low side for the completion of investigations. It will be more like one crore of rupees. The Kosi Dam, when constructed, will be the highest in the world—130' higher than the present highest dam, the Boulder Dam on the Colorado river in U. S. A. which is 726' above rock bottom. The dam site is situated in a highly seismic zone. The exploratory work and investitations at the site must therefore be very thoroughly done.

The proposed strength of engineering staff is adequate, for the present, but will have to be substantially increased if the recommendations under item VI are accepted.

The actual work of investigations at site was inspected by Dr. J. L. Savage and Mr. A. N. Khosla and is on sound lines. With more mechanisation in exploratory work and the operation of diamond crills—now that the Drill Foreman has joined—the work will be considerably accelerated.

Item VI. In respect of the Kosi Project in particular, what are your views as to:

- (a) the desirability of obtaining from Disposals construction machinery to the extent of nearly 40 lakks in anticipation of the construction of parrage canals and dam; the expenditure to be treated as suspense in the first instance and charged to the project when the latter receives sanction; this course was followed in connection with the Hirakud Dam Project, and
- (b) the desirability of
  - (i) undertaking the construction of a meter-gauge railway line to the barrage and dam site (length nearly 40 miles), and
  - (ii) undertaking the construction of the barrage and canal systems in advance of the construction of the dam.

In view of the recurring havoc caused by the vagaries and floods of the Kosi, and the need for growing more food for the country, the construction of this project is an urgent and vital necessity. This project with a potential development of 2 million k. W. of power and 3 to 4 million acres of annual irrigation, offers immense scope of development in the industrial and agricultural fields. The refore, any measures that are calculated to accelerate the work of investigations and, later, construction of this project, deserve to have the full support of the Government.

We fully endorse the proposals under (a), and (b) (i) and (b) (ii).

The exploratory work on the dam will take some time as also the trial load analysis which, it is hoped, the U. S. Bureau of Reclamation will undertake to do. In the meantime machinery and staff can be assembled and trained on the construction of the Barrage and Canal systems and kept ready for the bigg reconstruction programme for the dam. In this way large areas of land will be brought under irrigation in advance of the completion of the dam and the country prepared to receive the full benefits from the dam 3 to 4 years in advance, thus bridging the gap between completion of the project and development of its potential.

#### 2. NARBADA VALLEY PROJECTS

(APPENDIX IV)

## Items II to V of the Terms of Reference

- II. Are the proposals in respect of each one of the above projects, as put forward by CWINC, in order?
  - III. Is the cost of investigations, provided in the above proposals, justified?
- IV. Keeping in mind the proposed programme and priorities of investigations, is the proposed strength of engineering staff, provided in the estimates for the purpose adequate?
- V. Is it possible, by a re-arrangement of programme or priorities, to reduce expenditure, or at least spread it over a longer period, in respect of one or more of these projects

The Narbada basin appears to hold great potential of development, and such development is likely to have far-reaching effect on the economic advancement of the country in general, and the basin in particular. It appears feasible to bring under irrigation 37,00,000 acres of cultivated and cultivable land in the basin, generate continuous power of over a million K. W., and extend navigation from the river's outfall in the sea right up to and beyond Hoshangabad i.e., almost to the heart of the country. The principal works involved would be construction of about eight storage reservoirs, a number of barrages and three systems of canals and some navigation locks. An overall estimate for investigation of the total plan has been prepared and amounts to Rs. 95,91,144. Estimates, prepared on the basis of expenditure from year to year, which were submitted to Government for sanction, were also placed before us. The amounts were Rs. 1,70,740 for 1947-48 and Rs. 25,91,000 for 1948-49. These have been examined by us in detail and appear to be in order.

In this connection Mr. Man Singh pointed out that the cost of topographical survey, provided in the estimates, could be brought down considerably if the contoursurvey of the commanded-areas by the Survey of India Department could be reduced to just what was essential to enable the CWINC staff to pick up the channel alignments roughly, and thereafter do the detailed work themselves. This, he said, would have the added advantages, first, of reducing the work of the Survey of India, who had already too heavy a programme for the staff they have, and secondly train up the CWINC staff for such work. He said, he had tried this in Bengal and the resulting work was quite accurate. Mr. Pandit said, he was working on this basis in the Tapti basin and calculated that the overall cost would be reduced to half. This, in our opinion, is a good suggestion and should be adopted wherever possible. Taking the resulting economy into account the total cost of investigations will come down to about Rs. 74 lakhs.

At this stage we were also apprised of the views of the Secretary, W. M. P., and the reactions of the Chairman, CWINC, regarding cutting short the programme of work on account of present day shortages of men and materials. The notes on the subject are appended to this report (Appendix III). We entirely agree with this view and suggest that it will be desirable to restrict the work in the first 2-3 years to only such projects as will give the maximum results in the shortest possible time. Judged from this criterion, we recommend that invsetigations be concentrated on the following:—

Bargi Project. The project envisages construction of 3 dams and a system of canals to command 18,000,000 acres. It is calculated that in addition it would be

possible to generate 80,000 k. W. of firm power. As most of the water will be used up for irrigation it might not be possible to make the navigational feature very attractive.

Tawa Project. This envisages construction of a dam on the tributary Tawa just above its outfall into the Narbada a few railes above Hoshangabad. A dam of 170 feet height will intercept the entire run-off from a catchment of 2,340 square miles. An area of 11,00,000 acres would be commanded from the reservoir itself for irrigation. The power potential is likely to be 12,700 k. W. continuous.

Punasa Project. A dam of 237 feet height will intercept almost the entire residual run-off of the main river at this site. It is proposed to reserve a portion of the capacity for controlling the floods which occur frequently in the Broach district of Gujrat in Bombay Province. Taking this into account, the power potential of this project would be in the neighbourhood of 2,33,000 k. W. continuous. The lake would be navigable right up to its upper end, very near Hoshangabad.

Barrage and canal system for the Broach District. With the regulated supplies available from the Punasa Project it would be possible to command the entire cultivated area of Broach district, measuring about 8,00,000 acres for perennial irrigation.

In addition to concentrated investigations on these projects we also recommend that the cost of collection of such essential data as discharge and silt observations at various important stations, meteorological, mineral, navigational and economic surveys and special tools and plant required should be provided for in the estimate for investigation of the projects on a basin-wide basis.

At our request fresh detailed estimates have been prepared to cover these investigations and these amount to Rs. 64,97,000. The cost will be spread over a period of three years, Rs. 26,97,000 in the first, Rs. 19,00,000 in the second and Rs. 19,00,000 in the third year.

The strength of engineering staff provided is adequate for the purpose in view.

While examining this project it was brought to our notice that there is a proposal to utilize the land to be commanded for irrigation by the Bargi and Tawa projects for resettling and rehabilitating refugees from Sind and Western Punjab. If, on this account, therefore, the investigations have to be speeded up, and construction has to be launched upon simultaneously, the staff for these two rojects will have to be considerably strengthened to suit the pace at which progress would be demanded.

#### 3. TAPTI VALLEY PROJECTS

#### (APPENDIX V)

# Items II to V of the Terms of Reference

- II. Are proposals in respect of each one of the above projects, as put forward by CWINC, in order?
  - III. Is the cost of investigations provided in the above proposals justified?
- IV. Keeping in mind the proposed programme and priorities of investigations, is the proposed strength of engineering staff provided in the estimates for the purpose, adequate?

V. Is it possible, by a re-arrangement of programme or priorities, to reduce expenditure, or at least spread it over a longer period, in respect of one or more of these projects?

Examination of the proposals reveal that potential of development in this basin is also fairly great, although it is not likely to be as attractive as in the case of the Narbada basin. The plan envisages construction of six dams and three barrages together with their canal systems. Of these the developments on Girna river are being investigated and undertaken by the Government of Bombay. The estimated cost for investigations of the rest of the project amounts to Rs. 42,25,034. The yearly estimates for the years 1947-48 and 1948-49, amounting to Rs. 2,60,540 and Rs. 20,56,000 respectively, were also placed before us. The provisions are in order. But the cost of surveys should be reduced by the CWINC doing most of the work, leaving only the essential part to be done by the Survey of India.

In this case also, we suggest that attention for the present be concentrated on the lowermost dam at Ukai and the Kakrapara barrage and canal system and only silt observations, and meteorological, mineral, navigation and economic surveys be carried out for the rest of the basin, for the present. At our request an estimate to cover this limited objective has been prepared and amounts to Rs. 19,95,500. This cost will be spread over a period of two years, i.e., Rs. 12,00,000 in the first year, and Rs. 7,95,500 in the second year. The provisions and the strength of the engineering staff for the purpose are adequate.

#### 4. SABARMATI PROJECT

### (APPENDIX VI)

# Items II to V of the Terms of Reference

- II. Are the proposals in respect of each one of the above project, as put forward by CWINC, in order?
  - III. Is the east of investigations provided in the above proposals justified?
- IV. Keeping in mind the proposed programme and priorities of investigations, is the proposed strength of engineering staff, provided in the estimates for the purpose, adequate?
- V. Is it possible, by a re-arrangement of programme or priorities, to reduce expenditure, or at least spread it over a longer period, in respect of one or more of these projects?

This river passes by the industrial town of Ahmedabad where, we are informed the domestic water supply problem is acute. Authorities interested in the development of the basin are Bombay Prevince including Ahmedabad Municipality, Baroda State, Idar State and some States of Mahikantha, Sabar Kantha Agencies. Part of the catchment area lies in Udaipur State of the Rajputana Union. Projects for irrigation and improvement of domestic water supplies have been prepared by various agencies from time to time. But owing to disagreement regarding water-rights and other matters nothing has matured so far. Recently, we are informed, in a conference of representatives of various interests held at Bombay, it was decided to entrust the development of the basin on a unified basis to the CWINC in the hope that better progress will be made in finalising and then executing the projects. Some engineering staff was offered to be provided by governments of Bombay and Baroda for manning the organisation to be set up for the investigations. Accordingly, an estimate for preliminary investigations amounting to Rs. 15,10,000 was prepared. This and the

year to year estimates of Rs. 28,000 for the year 1947-48 and Rs. 5,20,000 for the year 1948-49 have been examined by us. No contour-levels are available in this basin. Maps of hilly portion merely show the form lines. It has, therefore, not been possible to indicate precisely the development that might be possible. Some preliminary investigations were done, in connection with a dam project at Dharoi. The result of the survey indicates roughly that the project would ensure irrigation for 1,00,000 acres and put the water supply position of Ahmedabad town on a surer footing. We recommend that, in the first instance, activities might be restricted to this one project only in this basin. At our request the estimate has been recast to provide for the necessary investigations of this project. It amounts to Rs. 7,87,000 and expenditure will be spread over two years, in the first year being Rs. 4,34,000 and in the second year Rs. 3,53,000. The provisions are reasonable and the staff provided is adequate.

In this, as in the case of Narbada and Tapti, discharge and silt observations, meteorological observations etc., will be taken up on basin-wide seale and provision has been made in the recast estimate.

# 5. C. P. & 6. BASTAR PROJECTS

(APPENDIX VII)

Items II to V of the Terms of Reference

- II. Are the proposals in respect of each one of the above projects, as put forward by CWINC, in order?
  - III. Is the cost of investigations, provided in the above proposals justified?
- IV. Keeping in mind the proposed programme and priorities of investigations, is the proposed strength of engineering staff, provided in the estimates for the purpose, adequate?
- V. Is it possible, by a re-arrangement of programme or priorities, to reduce expenditure, or at least spread it over a longer period, in respect of one or more of these projects?

  5. (C.P.)

Besides Narbada and Tapti basins, it is also proposed to undertake investigations for development in the mid-Godavari and upper Mahanadi basins. The projects in the mid-Godavari basin were principally on the Wainganga and Wardha tributaries of the Godavari. In view of the fact that a very big project is being undertaken by the C. P. engineers on the lower Wainganga we consider it desirable for the present for the CWINC to concentrate on the upper Mahanadi basin only. There are four projects, three on the tributaries and one on the main river which appear to be very promising and will result in assuring irrigation for 6,50,000 acres of land and enable 23,000 k.Ws. of continuous power being generated. The regulated supplies from these projects will also increase the power potential of the Hirakud and other lower projects on lower Mahanadi. The work of investigations could be taken up by one Division.

At our request the estimate for investigations has been recast and now amounts to Rs. 27,04,500 for the Mahanadi basin in place of Rs. 47,44,000 for the Mahanadi and Godavari basins. In the recast estimate costs of surveys by Survey of India have been reduced as in other cases. Other provisions are reasonable and the staff provided adequate.

As in the case of other valley investigations, the silt mineral, meteorological and other general investigations will be earried out over the whole basin.

### 6. (BASTAR)

The area of what until recently was known as Bastar State is very sparsely populated. Cultivation is done on a very restricted scale and mineral resources, which are very great have not at all been explored or exploited. A good part of the state is on a plateau at an elevation of over 2,000 ft. above mean sea level. The rainfall is good and the elimate exhibitance.

On these accounts it is not unlikely that the territory might be utilized for resettling and rehabilitating refugees from Western Pakistan. This, we find, can be achieved without disturbing or encroaching upon the areas occupied by the tribal population.

The principal river of the state, Indravati, has great potential for Power development which is absolutely necessary for the rich iron ores aggregating to over 1,000 million tons, containing 63 per cent to 70 per cent pure iron to be utilised for manufacture of steel etc. Some good sites have been located where development will be very attractive. The power potential of these projects will be in the neighbourhood of 3,00,000 k.Ws. continuous.

On the Sabri river one project has been located which would enable bringing under irrigation 6,90,000 acres of land, and produce 14,000 k.Ws. of continuous power.

We agree that all these projects should be investigated on a priority basis and the proposal to set up one Division for the purpose has our approval. The estimate amounts to Rs. 27,04,000 and the expenditure would be spread over 3 years. The provisions made in the estimate are reasonable and the staff proposed adequate.

One Superintending Engineer would be necessary to control the two Divisions in this region, i.e., one in the Upper Mahanadi and the other in Bastar State. The estimates provide for the entertainment of a Superintending Engineer and his office staff.

Total expenditure on investigations in C. P. and Bastar rivers will thus be Rs. 54,09,000 spread over three years. The yearly expenditure will be Rs. 16,00,000 in the first year, Rs. 20,00,000 in the second year and Rs. 18,09,000 in the third year. They are in order and compare favourably with the estimates for the years 1947-48 and 1948-49 amounting to Rs. 16:52 lakhs (Provision was for 13 months only).

#### 7. ASSAM PROJECTS

#### (APPENDIX VIII)

## Items II to V of the Terms of Reference

- II. Are the proposals in respect of each one of the above projects, as put forward by CWINC, in order?
  - III. Is the cost of investigations provided in the above proposals justified?
- IV. Keeping in mind the proposed programme and priorities of investigations, is the proposed strength of engineering staff, provided in the estimates for the purpose, adequate?

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V. Is it possible, by a re-arrangement of programme or priorities, to reduce expenditure, or at least spread it over a longer period, in respect of one or more of these projects?

The territory, with its magnificent rivers and the narrow gorges in the Himalayan ranges through which they flow, offers an almost unlimited scope for power development. CWINC, in consultation with the Government of Assam, have selected for the present four projects for preliminary investigations. An estimate amounting to Rs. 50,00,000 to cover the cost and programmes of expenditure for the years 1947-48 and 1948-49 amounting respectively to Rs. 2,67,000 and Rs. 20,41,000 have been examined by us and are, in our opinion, reasonable. But, for considerations similar to those which have led us to recommend curtailment of activities in other basins, we suggest that only two out of the four projects should be taken up for investigation at present. These, in our opinion, should be Manas and Dihang. The priorities allotted to the projects should be changed to give Manas the higher, as it is close to the rest of India and not too far from the industrial area of Assam. This project has a bigger irrigation potential as well. Besides, the channel below is likely to provide a link for the navigation canal which is being thought of from the Teesta barrage to the Brahmaputra. The Dihang will be No. 2 priority, but taken up simultaneously for investigation.

In addition to discharge and silt observations, meteorological, mineral and economic surveys, and surveys for navigation should be planned for the entire area. A recast estimate to cover our recommendation has been prepared and now amounts to Rs. 30,73,700 spread over two years. Expenditure will be Rs. 14,00,000 in the first and Rs. 16,73,700 in the second year. The provisions are reasonable and staff provided adequate, one of the three divisions previously provided having been curtailed.

## 8. COORG PROJECTS

# (APPENDIX IX)

# Items II to V of the Terms of Reference

- II. Are the proposals in respect of each one of the above projects, as put forward by CWINC, in order?
  - III. Is the cost of investigations provided in the above proposals justified?
- IV. Keeping in mind the proposed programme and priorities of investigations, is the proposed strength of engineering staff, provided in the estimates for the purpose, adequate?
- V. Is it possible, by a re-arrangement of programme or priorities, to reduce expenditure, or at least spread it over a longer period, in respect of one or more of these projects?

The estimate to investigate the projects in Coorg viz. Herangi Irrigation and Power Project, the Baropole Hydel Project, the Lakshamantirtha Irrigation Project and the projects for renovation of irrigation tanks, amounting to Rs. 6,64,740 and one for the year 1948-49 amounting to Rs. 2,24,000 have been examined. We suggest that work of investigations on renovation of tanks be omitted and the proposals should be amended to provide for only two S. D. Os. and the adequate number of subordinates and elerical staff instead of one Executive Engineer and three S. D. Os. The work of investigations could be completed in about two years. The estimate has accordingly

been amended and now amounts to Rs. 4,52,000 and the expenditure for the year 1948-49 and 1949-50 will be respectively Rs. 2,20,000 and Rs. 2,32,000. The provisions are reasonable and the expenditure will be justified. The staff provided is adequate.

### GENERAL

Before concluding we would like to bring to the notice of the Government that some special allowance should be given to officers and men on field duties in connection with investigation and construction of such projects as the localities where they have to work are generally unhealthy, communications are difficult and the work arduous. Unless an incentive in the shape of such allowance is given people would generally prefer to be on less arduous jobs—elsewhere. This particular point was not amongst our terms of reference but we feel it would not be fair not to bring this aspect to the notice of Government, as it is only contented staff that could be relied upon to do the work efficiently and economically specially in these days of shortages.

The original estimates placed before us are appended as also the estimates now prepared which are approved by us."

(Sd.) A. N. KHOSLA

(Sd.) J. L. SAVAGE

(Sd.) M. NARASIMHAIYA

DATED NEW DELHI; the 18th May 1948.



#### APPENDIX 1

Terms of Reference of the Ad-hoc Committee, appointed by the Government of Ludia in the Ministry of Works, Mines and Power in connection with the investigations of the River-valley projects, sponsored by the C. W. I. N. C.

"The projects concerned are :-

- 1. Kosi,
- 2. Narbada,
- 3. Tapti,
- 4. Sabarmati,
- 5. Central Provinces and
- 6. Bastar rivers,
- 7. Assam Valley, and
- 8. Coorg.
- Item I.—What would you consider to be a reasonable cost of investigations of a project in relation to the overall capital cost of that project?
- Item II.—Are the proposals in respect of each one of the above projects, as put forward by C.W.I.N.C. in order?
  - Item III.—Is the cost of investigations provided in the above proposals justified?
- Item IV.—Keeping in mind the proposed programme and priorities of investigations, is the proposed strength of engineering staff provided in the estimates for the purpose adequate?
- Item V.—Is it possible, by a re-arragnement of programme or priorities, to reduce expenditure, or at least spread it over a longer period, in respect of one or more of these projects?
- Item VI.—In respect of the Kosi Project, in particular, what are your views? as to
  - (a) the desirability of obtaining from Disposals construction machinery to the extent of nearly Rs. 40 lacks in anticipation of the construction of barrage, canals and dams; the expenditure to be treated as suspense in the first instance and charged to the project when the latter receives sanction: this course was followed in connection with the Hirakud Dam Project; and

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- (b) the desirability of
  - (i) undertaking the construction of a meter gauge railway line to the barrage and dam sites (length nearly 40 miles), and
  - (ii) undertaking the construction of the barrage and canal systems in advance of the construction of the dam."

IMPORTANT DATA IN RESPECT OF VARIOUS PROJECTS

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	No.	<del></del>	1	M M	20	H		C A B		<u>8</u>

While other investigations are expected to finish by 1950 thus enabling construction to be taken in hand before that was survey work in the Keel flood plain for irrigation and dealnage work will continue for a number of years and the construction of canals and distributaries will progress as survey proteeds.

#### APPENDIX II

#### KOSI PROJECT

#### REPORT

At their meeting held on the 29th July 1946, the Standing Finance Committee agreed to an expenditure of Rs. 31 44 lakhs on the preliminary surveys and investigations for the Kosi Project during the year 1946-47 and 1947-48. This sanction was communicated in W. M. P. letter No. D. W. 1201 (1), dated, the 27th May 1946.

- 2. The previous estimate had been framed with a view to ascertain the feasibility of the scheme. Investigations so far carried out have now shown that the scheme is definitely feasible and therefore investigations have now to be carried out in greater detail. Owing to difficult situation of the site and the enormity of the magnitude of the work, the detailed investigations will have to extend beyond 1950 but they shall have progressed sufficiently by March 1950 to enable construction to be taken in hand. This estimate amounting to Rs. 65,26,000 has therefore been prepared to cover the period ending March 1950 and includes the amount of Rs. 31,44,000 already sanctioned. For completing the investigations the cost will be of the order of rupces one errore.
- 3. The present estimate covers the cost of investigations for the dam (excluding the cost of trial load analysis to be carried out in America, the cost for which will be included in the supplementary estimate for overall investigations) and the investigations for the barrage site and surveys for a portion of the area to be irrigated to the east of the Kosi. The survey work, owing to its magnitude, will take a number of years to complete. The construction of the barrage can however be taken in hand without waiting for the completion of surveys for the irrigation area and the construction of irrigation system can proposed as surveys progress. For the present, it is proposed to concentrate on the surveys and investigations of the canal system to the east of the Kosi. The cost of the remaining surveys will be included in the supplementary estimate for the overall investigations.
- 4. Credit has been allowed in the estimate for the recovery value of T.& P. as also of buildings most of which have been provided in pre-fabricated structures.

(Index map showing dam site, etc. is enclosed)

BALWANT SINGH NAG, Project Officer (Kosi).

# Kosi Project

Estimate for preliminary surveys and investigations for the Kosi Project for the period, ending March 1950.

950.		1	bstra	ct								
											•	Rs.
- 1 - Gunyay of Indie	• .									•		22,70,000
<ol> <li>Surveys by Survey of India</li> <li>Surveys under C. W. I. K. C.</li> </ol>		•		•			•					37,500
2. Surveys under C. W. 19 3. Discharge Observations							•					80,500
4. Silt Observations		٠,					•					18,000
5. Property Surveye												21,400
6. Ground Water Surveys	٠.											Nil
7. Meteorological Surveys .											•	2,93,900
8. Seismological Surveys												1,14,000
9. Geological Investigations .												12,03,750
10. Roads and Paths					٠.							1,67,000
11. Aerial Ropeways											٠.	48,000
12. Soil conservation survey for co	ntroil	ing s	ilting	of Da	m.							80,000
13. Agricultural and Soil surveys	for Irr	igati	on .								,	60,000
14. Survey of Fish Fauna .		•					.•					5,000
15. Industrial and Load Surveys							•					5,000
16. Wooden Models												10,000
17. Temporary accommodation				-	7:01274					Ċ		2,70,000
18. Camp equipage			.0	7-66	LES .	3						96,000
19. Tools and Plants new supply			Con I			193		Ċ	·			2,33,900
20. Repairs and carriage to T. & I			1			do						80,000
21. Laboratory at Barakeshtra		·	, S	1		7.2		Ī	·	•		15,000
		•	16			29	•	•	•	•	• -	
				W					Total	•		50,88,350
						1			Say			50,88,400
22. Contingencies on Rs. 50,88,400	-						•	٠.	•	•	•	2,54,400
23. Establishment (Salary, T. A. a	und con	ating	encies	3)	0:1		•	٠	•	•	•	11,83,000
			115	100	4 4				Grand ?	<b>C</b> otal		65,25,800
				-					Say	•	•	65,26,000
				CO CA IN	m							

BALWANT SINGH NAG, Project Officer (Kosi).

# Estimate of preliminary surveys and investigations for the period, ending Merch 1960.

Rs.  1 Surveys to be carried out by Eurocy of India under guidance of the C. W. I. N.C.—  (a) For dam Sito  Comprising norial-photography of the garge and the reservoir area, survey and map publication of the dam site to scales with of  (i) 1 = 1000  (ii) 32" = 1 mile  Survey and map publication of the reservoir area and the Contra gorge to a site of 4" = 1 mile with 20" contrar interval and 1" or sear scale survey. I Dath Kosi reservoir sto (ingot)  (b) For irrigation and drainage area to a scale of 4" = 1 mile with 20" contrar interval and 1" or sear scale including the river (preserved set (ingot))  (c) Cost of various photography 25,05,000 acres, at Ro. 1 per acc.  (c) Cost of various photography 25,05,000 acres, at Ro. 1 per acc.  (c) Cost of various photography 25,05,000 acres, at Ro. 1 per acc.  (d) Longitudinal section of the river and x-sections (1000" opart) 30 raides at Rs. 100 per mile  (e) Surveys to be carried out by or miles at the river and x-sections (1000" opart) 30 raides at Rs. 100 per mile  (b) Surveys for railway and road alignments for the dam and the harrage  (c) Alignment of Eastern Kosi Canal and branches: 700 miles at Rs. 25 per mile  3 Discharge Observations.  Number of sites  Expenditure per site (non-recurring)  Current Motors 12  Boat large 1  1,000  Boat small 1  600  Sounding rods, otc.  1160  Ropes	)9 
1 Surveys to be corried out by Survey of India under guidance of the C. W. I. N.C.—  (a) For dam Sito  Comprising actial-photography of the garge and the reservoir area, survey and map publication of the dam site to scales will of  (i) 1 = 1000  (ii) 32" = 1 mile  Survey and map publication of the reservoir area and the Contra gorge to a sole of 4"=1 mile with 20" content interval and 1" or man scale survey of Dudh Kosi reservoir site (in	<b>)</b> 9
(a) For dam Site  Comprising social-photography of the garge and the received area, survey and map publication of the dam site to scales will of  (i) 1 = 1000  (ii) 32" sel mide  Survey and map publication of the reservoir area and the Centra gorge to a select of 4"=1 mile with 20" content interval and 1" or scar scale survey of Dudh Kosi received sets (in expel)  (b) For irrigation and draining area to a scale of 4"=1 ratio Mais of Kosi including the river (pure sees only) 25,00,000 area, at its, 1 per acc.  (c) Cost of various photomossies, and project stages for designed days and publication of map places and appendiance for the "section"  2 Surveys to be corried out by or mider the direction of the C. W. in M. Constitution.  (a) Longitudinal section of the river and x-sections (1056 apart) 50 ratios at Rs. 100 per mile  (b) Surveys for railway and road alignments for the dam and the harrage  (c) Alignment of Eastern Kosi Canal and branches: 500 miles at Rs. 25 per mile  3 Discharge Observations.  Number of sites  Number of sites  Expenditure per site (non-recurring)  Current Meters 11  Sounding rods, ote.  Ropes  500  150	<b>)</b> 9
and map publication of the dam site to scales will of  (i) 1 = 1000  (ii) 32" = 1 mile  Survey and map publication of the reservoir area and the Castra gorge to a scient of 4"=1 mile with 20" content interval and 1" or scar scale survey of Dadh Kosi reservoir sets (in orpsi)  (b) For irrigation and drainage area to a scale of 4"=1 mile Mile of Kosi including the river (preservoir sets (in orpsi)  (c) Cost of vertices photomospies, and project maps for described mand publication of map places and expendition for the "server"  2 Surveys to be carried out by or miles and direction of the C.W. in 10. Supplies and publication of map places and exections (10%" opart) 50 miles at Rs. 100 per mile  (a) Longitudinal section of the river and x-sections (10%" opart) 50 miles at Rs. 25 per mile  (b) Surveys for railway and road alignments for the dam and the harrage.  (c) Alignment of Eastern Kosi Canal and branches: 500 miles at Rs. 25 per mile  3 Discharge Observations.  Number of sites  (a) Expenditure per site (non-recurring)  Current Motors 11  Boat large 1  Sounding rods, ote.  150  150  150  150  150  150  150  15	<b>)</b> 9
Survey and map publication of the reservoir area and the Centra gorge to a s is of 4"=1 mile with 20" content interval and 1" or scar scale survey of Duth Kosi reservoir area (in	<b>)</b> 9
to a s is of 4°=1 mile with 20' content interval and 1' or car scale survey of Duth Kosi representation (in equal)  (b) For irrigation and draining area to a scale of 4°=1 take Batt of Kosi including the river (norm area only) 25,00,000 acres, at Re. 1 per acre.  (c) Cost of various photomospies, and project maps for detailed and and publication of map planes and appendices for the "conjugation and publication of map planes and appendices for the "conjugation."  (a) Longitudinal section of the river and x-sections (1000' neart) 50 miles at Rs. 100 per mile  (b) Surveys for railway and road alignments for the date and the barrage.  (c) Alignment of Eastern Kosi Canal and branches: 500 miles at Rs. 25 per mile  Discharge Observations.  Number of sites  (b) Expenditure per site (non-recurring)  Current Meters 11.  Boat large 1.  1,900  Boat small 1.  600  Ropes  700  150  150  150  150	<b>)</b> 9
(b) For irrigation and draining area to a seed of 4 — 1 take East of Kosi including the river (pare even only) 25,00,000 acres, at the 1 per acre.  (c) Cost of various photomossies, and project maps for detailement and publication of map planes and epopulates for the "expectations".  2 Surveys to be corried out by or sender the direction of the C. W. in M. Susseits for the Rs. 100 per mile.  (a) Longitudinal section of the river and x-sections (1000' apart) 50 railes at Rs. 100 per mile.  (b) Surveys for railway and road alignments for the data and the barrage.  (c) Alignment of Eastern Kosi Canal and branches: 500 miles at Rs. 25 per mile.  Discharge Observations.  Number of sites.  (b) Expenditure per site (non-recurring)  Current Motors 11.  Boat large 1.  Sounding rods, ote  Ropes.  150	<b>)</b> 9
(c) Cost of various photomosaies, and project mage for described and publication of map places and appendies for the "separation".  2 Surveys to be carried out by or maker the direction of the C. W. in N. Secretarion  (a) Longitudinal section of the river and x-sections (1052' apart) 50 miles at Rs. 100 per mile.  (b) Surveys for railway and road alignments for the dars and the harrage.  (c) Alignment of Eastern Kosi Canal and branches: 500 miles at Rs. 25 per mile.  Discharge Observations.  Number of sites  Current Moters 11	
(a) Longitudinal section of the river and x-sections (1000 apart) 50 miles at Rs. 100 per mile  (b) Surveys for railway and road alignments for the data and the barrage.  (c) Alignment of Eastern Kosi Canal and branches: 500 miles at Rs. 25 per mile  3 Discharge Observations.  Number of sites  (b) Expenditure per site (non-recurring)  Current Meters 11  Boat large 1  Sounding rods, etc.  150  Ropes  150  150  150  150  150  150  150  15	
Rs. 100 per mile  (b) Surveys for railway and road alignments for the dark and the harrage.  (c) Alignment of Eastern Kosi Canal and branches: 700 miles at Rs. 25 per mile  3 Discharge Observations.  Number of sites  Expenditure per site (non-recurring)  Current Meters 11  Boat large 1  Sounding rods, otc.  Ropes  1,000	
(b) Surveys for railway and road alignments for the dark and the harrage.  (c) Alignment of Eastern Kosi Canal and branches: 500 miles at Rs. 25 per mile  3 Discharge Observations.  Number of sites  Expenditure per site (non-recurring)  Current Meters 11	, io
Discharge Observations.  Number of sites  Expenditure per site (non-recurring)  Current Meters 11  Boat large 1  Boat small 1  Sounding rods, ote.  Ropes  1256  1256  1366  1	
Number of sites	90 <b>37,6</b> 0
Expenditure por site (non-recurring)  Current Motors 11	1.000
Current Motors 11	
Boat large 1	
Boat small 1	
Ropes	•
Ropes	
. <b>3,</b> 5∂♦ 21,60	)@
Recurring Expenditure for 2 years per site.	
Head beatman at Rz. 75 p. m 1,869	
4 khalasis cum:boatmen at Rs. 60 p.m	
Ropes at Rs. 200 per anguen	
7,360	
Temporary gauge readers for flood souson 24 Nos. for 4	10
months por year for two years at Rs. 60 p.m	80,500
4 Silt Observations.	
Number of sites (5)	
Equipment (non-recurring) por sito  Rs. 1,000	
Recurring expenditure for 2 years: 2 khalasis per site at Rs. 55 p.m. 13,200	
Say 13,000	0 18,000

Property Survey.				
For 9 months.				
4 Surveyors at Rs. 180 p.m	6,480			
10 Khalasis at Rs. 55 p.m	4,950			
Camp charges	5,000			
Staff on deputation from Nepal .	, 5,000			
- -	21,430		Say 21,400	21,400
Managed Water Commence			$\mathbf{R}_{\mathbf{S}_{\bullet}}$	$\mathbf{Rs.}$
#round Water Surveys.  These will be done by staff.				Nil
Metserological Surveys.				
(Figures given by Meteorological Department) Class I Observatories, 2 Nes.				
Class II Obsorvatories, 2 Nes.				
Cluss III Observatories, 6 Nes.				
Class IV Observatories, 29 Nes.				
	Ŕs.	Rs.		
(a) Non-recurring expenditure.				
(i) Equipment	79,700			
(ii) Installation charges including buildings	48,800	1,28,500		
(b) Recurring charges for two years.				
Pay of Officors	4,800			
Pay of Staff :	1,00,000			
Dearness allowance	50,000			
T. A. & contingencies	10,000	1,64,800	2,93,300	2,93,300
	PART IN			
Seismological Surveys.	444			
(Based on flugures given by Meteorological Dep	ertment)			
One Cambridge Universal Vibrograph				
Ono Venner's 12" Acceloregraph		45,000		
Two units milneshaw korizental Seismograph	component			
One Benioff vertical seismograph	गव उराव			
Six wood-Anderson seismegraphs .		24,000		
	_	69,000		
(b) Buildings for observatories		20,000		
(e) Resurring expenditure for two years.	·			
Pay of staff	13,000	•••		
Allowances & Honoraria	6,000	• •		
Contingencies	6,000	25,000	1,14,000	1,14,000
9 Geological Investigations.				
	•			
(a) Equipment (non-recurring) Diamond drills 6 Nos	1,80,000			
	2,40,000			
Diamonds & spares for above				
Calyx drill complete	20,000			
Spares for above	5,000			
Special boats for drills 4 sets	10,000			
Dorrick, steel cables etc	5,000			
Compressors 4 Nos. at 5000	20,000			
Pumps 2 Nos.	6,000			
Hoists for vertical shafts: 2 Nos	10,000			
	4,96,000			

(b) Labour and consumable stores for (i) 30,000' of diamond drilling at				
Rs. 12 per foot .  (ii) 2 Vertical shafts for under river tunnel 200' deep each 48" dia-	<b>8,60,00<del>0</del></b> .			
meter at Rs. 100 a foot  (iii) Cross tunnel under the river 500'	40,000			
at Rs. 100 per foot . (iv) Drifts $7' \times 5'$ length 8000' at	50,000			
Rs. 50 per foot	4,00,000			
(c) Specialists.	8,50,000			
One drill foreman at Rs. 2000 p.m. for 2 years	48,000			
Subsistence allowance for above at Rs. 584 p.m.=14,016 say	14,000			
Passage both-ways	7,500			
Consulting Geologist's fees	15,000			
Resident Geologists 2 Nos. for one		•		
year at Rs. 350 p.m.  Dearness Allowance, T. A., etc.	8,400			
Doublook Allowallog, 1. A., 600,	3,600			
	96,500	-	14,42,500	
Deduct cost of tools and plants detailed will be available for use on other taken on stock suspense for furt other works.	works to be her use on	Rs.	Rs.	
75 per cent of Rs. 1,80,000, the cost of drills	Rs. 1,35,000			
75 per cent of Rs. 20,000, the cost of calyx drill	15,000			
Spares	50,000			
75 per cent of Rs. 10,000 the cost of special boats	7,500			
75 per cent of Rs 5,000, the cost of Derrick steel cables	3;750			
75 per cent of Rs. 20,000, the cost of compressors	15,000			
75 per cent of Rs. 6,000, the cost of pump	4,500			
80 per cent of Rs. 10,000, the cost of hoists	8,000		2,38,750	12,03,750
10 Roads and Paths.			· , · · · · · · · · · · · · · · · · · ·	
(a) Construction				
(i) Widening and improving existing p Barakeshtra and Chatra		20,000		
(ii) Tow Path from Chatra to Dam sit		10,000		
(iii) Footpath from Barakeshtra to Triber		25,000		
(iv) Footpath from Barakeshtra to Tribe		17,000		
(v) Footpaths along both banks of the	Tamur, from	4,000		
Tribeni to gauge site				
(vi) Footpath along the Sun Kosi f to gauge site		2,000		
(vi) Footpath along the Sun Kosi f	eni to Mach	2,000 4,000	· .	

	(b) Maintenance of Roads & Paths.			
	(i) Kutchs road from Joghani to Gatra 40 miles and €hatra to barrage site 16 miles	40,000		,
	(ii) All other feet-paths	25,000	65,000	1,67,000
	(17) 111 00001 1000-patrick		00,000	1,01,000
11	Aerial ropeway across the Sapt Kosi, the Tamur, the Arun and	the Sun Kosi,	•	
	4 Nos. at Rs. 12,000 each	• • •	48,000	48,000
12	Soil Conservation Surveys		80,000	80,000
13	Agricultural and soil survey for irrigation 4 million acres at 15,0 acres	00 per million	60,000	60,000
14	Survey of Fish Fauna	• • •	5,000	5,000
15	Industrial and Load Survey	• • •	5,000	5,000
16	Wooden models		10,000	10,000
17	Temporary Accommodation			
	(a) Dam Investigation			
	Non-Residential Administrative Quarters at Barakeshtra	8,500		
	(i) Inspection Houses at Barakeshtra and Jogbani			
	at 7,000 each	14,000		•
	(ii) M. B. Sheds for stores and workshops at	11.000		
	Barakeshtra	11,000		
	(iii) Store Shed at Chatra	8,000		•
	(iv) Laboratory and Store shed at Barakeshtra and Tribeni 2 Nos.	16,000		
	(c) M. B. Shed Class IV	10,000		
	(vi) Petrol godown	1,000		
	(vii) Magazine for explosives	4,000		
	(viii) Dispensary building	3000		
	(ix) Office building for Divisional and Sub-Divisional			
	offices	18,000		
	(x) Sheds for skilled and unskilled labour 200 Nos.	10,800		
	(xi) Sheds for cooking meals for the above labour	4,200	1.00 800	
	(x21 Miscellaneous buildings ,	14,000	1,22,500	
		Rs,	Re.	Rs.
	Residential			
	(i) Executive Engineer's Bungalow	6,000		
	(ii) Residences for six gazetted officers (3 S. D. Os., 2 Geologists and I Meteorologist)	18,000		
	(iii) Accommodation for clerks, drawing staff, store-	,		
	keepers, compounders and laboratory assistants 25 Nos.	25,000		
	(iv) Accommodation for Supervisors, Silt Analyst, Research Assistant 25 Nos.	40,000		
	(v) Drill Foreman's quarter: 1 No	5,000		
	(vi) S. D. Os. visiting quarter at Tribeni	1,500		
	(vii) Time Keepers, Gauge Readers, Daffadars, Bar- kandazea, Peons, Chowkidars, Dak Runners, Boatmen, Nepalese guards, Sweepers' quarters at	,		
	Rs. 350 each 80 Nos.	28,000		
	4.213 0			
	(viii) Servants quarters at camp sites: 3 Nos	1,500		

(b) Irrigation and Drainage investigations.		
Accommedation for efficers and stores sheds, etc. L. S. 50,000 for each division 2 Nos.	1,00,000	
-	3,47,500	
Deduct the cost of materials from prefabricated struc- ture like M. B. Sheds, Lakore Sheds, Nissen Raeds which will be available for use on other Projects to be taken on stock suspense and credited to this work	77,000	
	2,70,000	2,70,000
18 Camp Equipage.		
(i) For Dam Division.		
4 Tents 14' × 14' @ 1,400	39,100	
(ii) For Irrigation Divisions.		
4 Tents 14' × 14' @ 1,400	56,9 <del>0</del> 0	96,0●₽
19 Tools and Plant.		•
(i) Special Tools		•
For Kosi Dam Division.		
Jeeps with Trailers 2 Nos. @ 6,000		
For Irrigation Division.		
Jeeps and trucks 2 Nos. @ 6,000		
Instruments.		
For Kosi Dam Nivision.		
Levels 12 Nos. @ 1,000		

For Kosi Irrigation Division.	Rs.	Rs.	Ps.
Levels 24 Nos. at 1,000	24,000**		, -
Theodolites 6 Nos. at 3,500	21,000**		
Other suveying and drawing instruments Soil testing and Laboratory equipment	10,000 10,000		
(iii) Office Furniture and other T. & P.	10,000		
For Kosi Dam Division.			
Office furniture for Executive Engineer and S. D. Os.	6,000		
For Kosi Irrigation Divisions.			
Miscellaneous T. P. at 10,000 Per Division	20,000		
Offico furniture for Executive Engineer and Sub-	-0,000		
Division Officers	12,000	3,26,900	
Deduct cost of stores likely to be available for use on other			
works and projects after completion of the investiga-	1 1 to		
tion to be taken on stock suspense and cost to be			
eredited to this work as under: 25% of the cost of items marked *pro-page	42,000		
75% of the cost of items marked ** above .	51,000		
0 Repairs and Carriage of vehicles		93,000	2,33,90
Silt and chemical laboratory at Barakoshtra	60,000 15,000	60,000 15,000	
2 Contingencies at 5% on the amount of Rs. 50,38,400	2,54,400	2,54,400	
8 Establishment.			
(i) Kosi Dam Investigation Division.			
1 Executive Engineer for 3 years @ 1,150 p.m	41,400		
3 Asstt. Engineers for 3 years @ 350 p.m.	37,800		
15 Supervisors for 3 years @ 150/-p.m.	81,000		
l Accountant for 3 years @ 235/- p.m.	8,460		•
l Head Clerk for 3 years @ 170/- p.m.	6,120		
3 Sub Divisional Clerks for 3 years @ 80/- p.m.	8,640		
1 Accounts Clerk for 3 years @ 100/- p.m.	3,600		
4 Clorks for 3 years @ 55/- p.m.	7,920		,
6 Clorks for 2 years @ 55/- p.m.	7,920		
I Sr. Draftsman for 3 years @ 150/- p.m	5,400		
I Jr. Draftsman for 3 years @ 140/- p.m.	5,040		
1 Tracer for 2 years @ 60/- p.m.	1,440		
1 Ferro Printer for 2 years @ 60/- p.m.	J,440		
1 Civil Asstt. Surgeon for 3 years @ 370/- p.m.	13,320		
1 Compounder for 3 years @ 60/- p.m	2,160		
l Research Asstt. for 3 years @ 160/- p.m.			
3 Silt Analysts for 3 years @ 100/- p.m ,	5,760 10,800		
1 Silt Analyst for 2 years @ 100/- p.m			
1 Laboratory Assett. for 2 years @ 60/ p.m	2,400		
1 Laboratory Attendant for 2 years @ 40/- p.m.	1,440 960		
1 Seismological Asstt. for 1 year @ 160/- p.m			
1 Senior Observer for 1 year @ 100/- p.m	1,920		
1 Junior Observer for 1 year @ 60/- p.m	1,200		
6 Guago Readers for 3 years @ 35/- p.m.	720		
	7,560		
4 Daffadars for 3 years @ 30/- p.m	. 4,320		
8 Peons for 3 years @ 30/- p.m	6,480		
	8,640		
7 Nepalese Police Guards for 3 years @ 35/- p.m.	8,820		
1 Dispensary servant for 3 years @ 30/- p.m	1,080		
2 Storekeepers for 2 years @ 80/- p.m	8,840		
4 Special pays for handling cash for 3 years at 20/-p.m.	2,880		
Add provision for increments	10,000		
	,	3,10,480	

	(ii) Irrigation and Drainage	Invest	igation Divi	sions.				
	2 Exec. Engineers for	years	@ 1,000/- 1	.74.			48,000	
	6 Austt. Engineers fer		-				50,400	
	20 Supervisors for 2 year						72,000	
	2 Accountants for 2 ye						9,600	
	2 Head Clerks for 2 ye						7,686	
	2 Accounts Clerks for		-	M;			4,800	
	6 Sub-Divisional elerka						11,520	
	16 Asstt. Clerks fer 2 ye			•			21,120	
	2 Storekeepers for 2 ye						2,840	
	1 Sr. Draftsman for 2						2,600	
	2 Jr. Draftsmen for 2						4,800	
	2 Tracers for 2 years						2,880	
	2 Ferroprinters for 2 y						2,880	
	6 Guage Readers for 2						5,040	
	8 Daffadars for 2 years						5,760	
	24 Barkandazes for 2 ye						17,280	
	16 Peons for 2 years @		•				11,520	
	1 Asstt. Soil Specialist			p.m.			4,200	
	6 Soil Analysts for 2 y	•		1.			14,400	
	1 Peon for 1 year @ 3						360	
	8 Special pays for hand	_		rs at 2	0/- p.m.		3,840	
	Add provision for incre	-	the street of the street of the	-			20,000	
		63		43	•			3,29,120
	(iii) Direction Office.	Y						
	1 Stenographer for 2 ye	ears @	170/- p.m.	<i>iii</i> .			4,080	
	1 Superintendent for 2	years	@ 250/- p.m				6,000	
	1 Circle Clerk 2nd for :	yours	@ 160/- p.r	n.			3,840	
	3 Upper Division Clerk	s for 2	years @ 80	/- p.m.			5,760	
	4 Lower Division Clerk	s for 2	years @ 55	/- p.m.	•		5,280	
	1 Sr. Draftsman for 2 y	ears (	7 150/- p.m.	7.1			3,600	
	1 Jr. Draftsman for 2	years (	@ 100/· p.m.				2,400	
	1 Tracer for 2 years @	60/- r	m. He ser	3 .			1,440	
	1 Ferroprinter for 2 ye	ars (g	60/- p.m.				1,440	
	l Daftri for 2 years @	35/- p	.m				840	
	6 Peous for 2 yours @	30/- p	.m. ,				4,320	
	1 Barakandaz for 2 yea	ы (а)	30/• p.m.				720	
	I Special Pay for h	andlin	g cash for	2 ye	ars at			
	20/- p.m	•	• •	•	• •		480	
	Add provision for incre	monts		•			2,200	
	(b) Dearness and Nopal Con	pensa	tory allowar	ices.		•••••		42,400
rial No.	Class of Estt.		No.	Period in Yr		. A.	Neps Allco.	
						Rs.	Rs.	
1	Executive Engineer	•	1	3		,140	5,400	
	Executive Engineers	•	2	2	4	,800	_	
2	Asatt. Engineers	•	3	3	7	,560	. 8,100	
			6	2	10	,800	1,800	
	Supervisors	•	15	3	24	300	21,600	
3	outer traces	-		-			•	

Serial No.

					Ì	21				
4	Accountants				1	8	1,800	1,089		
					2	2	2,160			
5	Circle Supdt			. •	1	2	1,200	••	*.	
6	Circle 2nd Clerk				1	2	1,080	• •		
7	Head Clerk .				1	3	1,620	1,080		
8	Accounts elerk .				1	3	1,260	900		
9	Head Clerks .		•	•	2	2	2,160	• •		
10	Accounts elerks			•	2	2	1,680	••		
11	Upper Div. Clerks			•	3	2	2,520	• •		
12	Sub-Div. Clerks			•	3	3	3,780	2,160		
	•				6	2	5,040	480		
13	Steno for Project of	icer		•	1	3	1,620			
14	Clerks	•		•	4	3	5,040	2,880		
					26	2	21,840	3,360		
15	Storekeepers .	•		•	4	2	3,360	1,440		
16	Sr. Draftsman .	•	•	•	1	3	1,440	1,080		
					2	2	960	••		
17	Draftsman .	•	•	•	1	3	1,440	1,080		
18	Tracors	•	•	•		2	3,360	480	•	
19	Forroprinters .	•	•	•	4	2	3,360	480		
20	Civil Asstt. Surgeon		•	•	1	\$	2,520	2,700		
21	Compounder .	•	•	•	1 1	2	1,260	720		
22	Dispensary Servant	•	•	•	100	3	900	360		
23	Research Asstt.	•	•	•	1	3	1,620	1,440		
24	Silt Analysts .	•	•	•	3 1027	3	3,780	2,700		
				•	1	2	840	600		
25	Asstt. Soil Specialist	•	÷	•	1 9079	2	1,680	• •		
26	Soil Analysts .	•	•	•	6	2	5,040	600		
27	Laboratory Asstt.	•	•	•	1	2	840	480		
28	Laboratory Attenda		•	•	1,650	2	600	240		
29	Seismological Asstt.	•	•	•	The state of		540	480		
30	Sr. Observer .	•	•	•	1 (33)	I p	420	300		
31	Jr. Observer .	•	•	•	1	1	420	240		
32	Guage Readers .	•	•	•	6 HG		5,400	2,160		
33	Daffadars	•	••	•	•	2	3,600	480		
		•			4	3	3,600	1,440		
					8	2	4,800	240		
34	Barkandazes .	•	•	•	•	3	<b>5,40</b> 0	2,160		
			•		25	2	15,000	720		
35	Peons	•	•	•	8	3	7,200	2,880		
	_				22	2	13,200	240		
36	Daftri	•	•	. •	1	2	600			
37	Peon	•	•	•	1	1 _	300			
				•			2,17,080	77,580	2,94,660 Say	9,76,660 9,77,000
	(c) Travelling All	owar	ıces.				•			
	(i) For Kosi I			ision ;	@ 11,000 per	year f	or 3	33,000		
•	(ii) For 2 Irrigat	ion :	and D	rainae	Investigation	n Divisi	ons			
	@ 11,000 each			-				44,000		
	_	-				4.000		32,000		
	(iii) For Supdtg year for 2 ye		nginee •	rs Car	np staff etc.	4,000 F	er •	8,000	85,000	85,000

# (d) Contingencies

Contingencies			
(i) For Dam Investigation at 13,000 per year for 3			
years	39,000		
(ii) For 2 Investigation Divisions 13,000 each per			
year for 2 years	52,000		
(iii) For Direction Office 15,000 per year for 2 years	30,000	1,21,000	1,21,000
Total Establishment charges Rs.	11,83,000	•	

BALWANT SINGH NAG,
Project Officer (Kosi).



#### APPENDIX III

#### MINISTRY OF WORKS, MINES AND POWER

One of the factors governing the attitude of the S. F. C. to River Valley Projects is the high cost of preliminary investigations. Considering the difficulties of transport and the availability of steel and cement, I do not think that Government would be able to undertake a large number of river valley projects within a measurable period. Government are already committed to the Damodar Project as a whole, the Huakud Dam Project, the Bhakra and Nangal Projects, Rihand, Tungabhadra and Ramapadasagara to mention only a few of the prominent projects which must go ahead in any case. The Kosi Project on which we have already spent a large amount on preliminary investigations must also go ahead. Similar considerations would seem to apply to some of the dams on the Chambal, the Narbada and the Tapti. These projects will tax all our resources and the capacity of CWINC to the utmost for the next 5 years, if not for a longer period. In the circumstances, I am of opinion that CWINC should try and reduce the cost of preliminary surveys on all other projects which are now under contemplation, e.g., projects in the Assam Valley, in the C.P., Coorg and so on. It is quite unnecessary at this stage to undertake aerial survey of all these projects, nor does it seem worthwhile taking up a large number of such projects even for preliminary investigations. We should pick and choose and only take up projects which appear most likely to be profitable and concentrate our energies on such projects. For instance, it will not be possible for many years to utilize all the electrical potential in Assam. The utmost we can aim at is to build one large dam at a suitable site in Assam which will provide power and irrigation. A very rough investigation of the various projects in view will suggest which of them should be taken up for preliminary investigations; similarly in the Central Provinces and other areas. Even on the Mahanadi, I am inclined to think that we should not spend any more money on the third site, viz., Naraj. It will be quite enough if Tikkarpara site is explored. The investigations on the third site may well be undertaken 10 years hence, after Hirakud and Tikkarpara are nearing completion.

2. I have put down my tentative views as a basis for discussion with Mr. Khosla. If he agrees with me, will he kindly reduce his estimates for preliminary investigations of the Narbada-Tapti, Assam Valley, and other schemes before the next meeting of the S. F. C. I do not want the investigations on the Kosi to be curtailed nor on any other projects which are likely to be actually constructed during the next 5 years. But there is no point in spending large sums of money on other investigations which are not likely to be fruitful, at least for the next 5 or 7 years.

स्यापन नयन

Sd. B. K. Gokhale, 4-3-48. (Secretary).

Mr. Khosla

D. S. P.

I am in complete agreement with Secretary's views. Will Members and Directors note above and take immediate action as to "A" above in consultation with me so that I can discuss this with Secretary on Monday or Tuesday before I go on tour. This note should come back to me for return to Secy.

Sd. A. N. KHOSLA,

4-3-48.

(Charman, UWINC.)

#### APPENDIX IV

#### NARBADA VALLEY PROJECTS

#### REPORT

The Narbada river has hitherto been considered as useless for being exploited for either irrigation, power, or navigation, the latter beyond a certain small distance above its outfall into the Gulf of Cambay. In its course through the Broach district of the Bombay Presidency it frequently overflows its banks and floods the country-side on both banks. This fact as well as the projected development of other river basins in the country led the Governments of Bombay and C. P.-Berar to request the CWINC to take up the investigations for a basin-wide development of the river with flood control, irrigation, power generation and extension of navigation as the chief objectives in view. They offered to depute some of the engineering staff necessary for the work and also bear the cost of investigations in ease no projects matured.

Accordingly the topography and hydrology of the basin were taken up for study in the CWINC at the beginning of the year 1947. The river drains an area of nearly 40,000 sq. miles. The total annual precipitation of rain in the basin is normally over 90 million acre feet of water. At present the entire amount is running to waste into the sea. The river has a deep channel almost throughout its course except in the plains of Broach after it emerges from the last narrow gorge near Rajpipla. The bed slopes vary from a maximum of about 40 feet a mile to about 3.75 ft. a mile through the last gorge. In the Broach plains it flattens out to about  $2\frac{1}{2}$  to 3 inches per mile. Almost throughout its course it flows over basaltic formations.

A study of the topography has revealed that excellent storage sites exist both on the main river and on some of its tributaries where, by constructing dams of medium heights, reservoirs of varying capacities can be formed to hold back the excessive precipitation of rain during monsoon months and utilize the water for purposes of perennial irrigation, power generation, extension of navigation, fish culture and supplies for domestic uses all over the basin. Floods in the Broach area can be completely controlled by reserving the upper portion of their capacities for flood absorption in some of the lower reservoirs.

Most of these sites have been inspected both by Engineers and Geologists and the preliminary ground surveys have revealed that development of projects at the sites is feasible. It has been decided to take up, for the present, investigations of only 7 projects, a list of which is appended. The last two items of the list show the power and irrigation potential of the projects, which will aggregate to nearly one million K.W. of continuous power and a gross command of nearly 4 million acres respectively. The estimate amounting to Rs. 95,91,144 has been prepared to meet the cost of detailed investigations of these projects. Provisions have been made for collection of hydrological data including rainfall, temperature, and humidity and river gauging; surveys of dam sites, the reservoir areas and areas to be commanded for irrigation; soil surveys of the commanded area and geological surveys of the dam sites. Such other surveys as minerals of the entire basin, electrical load surveys, surveys for navigation, soil crosion and also economic surveys by Gokhale Economic Research Institute, Poona, have also been included in the programme of investigations and requisite provisions made in the estimate. Surveys of dam sites, roservoir areas and irrigation areas will be done through the agency of the Survey of India Department, while surveys of main canals and other channel alignments for distribution system for irrigation water will be done by CWINC staff. The hydrological surveys will be undertaken in close co-operation with the Indian Meteorological Department. Geological surveys both for minerals and foundation explorations will be done in close co-operation with the Geological Survey of India. Similarly surveys for pisciculture will be undertaken under the direction of the Director, Zoological Survey of India.

Two divisions have been formed to do the work. Each Division will have four sub-divisions together with requisite subordinate and ministerial staff. Such other staff as Meteorological Assistants, Research Assistants for soil survey, Silt Observers, Geologists, Drill foreman, etc. has also been provided for, as detailed in the estimate.

The work will take nearly four years to complete. But the investigations will be so phased that construction can be launched upon in case of features which can be taken up independently before the investigations on all projects are completed so as to obtain quick and maximum results. As soon as such stages are reached, estimates for construction will be prepared for sanction.

Adequate provision for acquiring necessary tools and plant and transport vehicles has been made at rates which prevail in the market at present.

A statement showing the rough data for the dam sites and the anticipated benefits from the projects is given below.

The following map and chart are exclosed—

- (1) An index map of the Narbada basin showing the proposed dam sites and projects.
- (2) A profile of Nurbada river and its main tributaries.

G. N. PANDIT,

Project Officer (Narbada and Tapti).



# NARBADA BASIN—ROUGH DATA FOR THE DAM SITES

1. Name of the river	Narbada	Burhnor	Narbada	Tawa	Narbada	Narbada	Narbada
2. Namo of the dam site ,	Bilghara	Ghugri	Bargi	Ranipur	Punasa	Barwani	Weir be- low gorge
3. Longth along river (Miles)	153	85	249	95	513	665	750 (approx.)
4. Latitude and Longitude of dum site	80°29 <b>′20″E</b>	80°42′0″E	79°55′30″E	77°59′0″E	76°28′0″E	74°41′0″E	
<u> </u>	22°49′40″N	22°44′45″N	V 23°1°0″N	22°35′30″N	22°17′0″N	22°2′0″N	
5. Catchment area above dam site					-		
(Sq. miles)	1900	1290	6180	2340	23600	32000	
6. Average rainfall in catchment (Inches)	60	60	55	59	45	42	
7. Probable mean annual runoff (m.a.ft.)	3.06	2.06	4.8	3.12	15.63	$22 \cdot 23$	
8. R. L. of river bed	1520	1570	1240	1020	650	350	•
9. Proposed F. T. L	1750	1745	1350	1190	887	590	
10. Maximum height of the dam at							
F. T. L. (feet)	. 230	175	110	170	237	240	
11. Length of the dam at F. T. L. (feet).	3960	5300	5120	. 2700	2400	2080	
12. Gross capacity of reservoir at F, T, L. (m.a.ft.)	1.90	1.57	2.59	5.0	17.14	25 · 18	
13. Dead storago (m.a.ft.)	0.19	0.13	0.29	1.5	1.52	2.85	
14. Max. area of water spread (acros) .	22900	32000	62200	89600	320000	390400	
15. Losses due to evaporation (m.a.ft.) .	0.08	0.10	0.25		1.03	1.28	
16. Reservo for flood control	0 00			••			
17. Net storage available	et e	1.34	2.05	3·14	14·60	21.00	
18. Continuous regulated discharge	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$		7730 T	5 14	. 14 00	21.00	
(cusecs)	3275	2380	9700	4140	20500	28980	•
19. R. L. of the top of dead storage .	1613	1638	1308	1147	790	470	
20. R. L. of tail race	1540	1585	1280	1125	670	375	
21. Average head available (feet)	141.5	106-5	50		168.5	15\$	
22. Continuous power available k.W.	30800	17500	32500	12700	223000	300000	
23. Gross area commanded (acres) .			18,00,000				8,00,000
12. 4.2.2.2	4	ni ense a			• •	• •	5,00,000
I.—Total live storage impounded	a . 31	l·13 m.a.ft	Total gro	es area com	maudod 37	,00,000 acre	e.

11.-Continuous power generable

Bilghara 30,800 k.W. Ghugri 17,500 ,, Bargi 32,500 ,, Tawa 12,700 ,, 223,000 ,, Punasa

At the dam botween Punasa and Harinphal 112,600 k.W.

Harinphal 250,000 ,,

At the two dams in the gorgo 320,000 ,, 9,98,500 ,, Total

G. N. PANDIT, Project Officer (Narbada and Tapti).

# NARBADA PROJECTS ESTIMATES

Overall estimate for preliminary surveys and investigations in connection with projects for the multipurpose development of the Narbada Basin.

			Abstr	uci							Rs	
I. WORKS—												
1. Dams and Appurtenant wo	rks											
A. Preliminary expenses	•	•	•	•	• • •	•	•	•	•		,74,0	
K. Buildings	•		•	٠,		•	•	•	•		. 1,00,0	
2. Main canul and Branches	•		•	•				•	•		. 45,46,5	
<ol><li>Discharge and silt observat</li></ol>	ions		•	•			•	•	•		. 2,00,0	00
4. Meteorological Observation	us.			•				•			. 25,8	00
5. Mineral surveys				•				•			. 10,0	100
6. Surveys for Pisciculture		•	•	•							. 2,0	100
<ol> <li>Malaria surveys</li> </ol>	•										. 5,0	Ю0
8. Electric Load surveys .	•			•			•				. 10,0	)00
9. Surveys for Navigation											. 1,00,0	000
10. Economic and property sur	rveys										. 60,0	000
11. Soil erosion surveys .											. 7,1	500
12. Communications							•				. 3,00,0	000
13. Special Tools and Plant .									· •		. 4,60,0	D <b>QO</b>
			17	TOURN.					•		67,00,8	200
2 per cent Contingencies .		. 1			0					,	. 1,34,0	
- 1	Ť	170	1	45			· _					
II. TOOLS AND PLANT		T					To	tal W	orks .		. 68,34,	816
Tools and Plant for the Div		8									. 4,38,0	100
	istons	•	1		100	•	•	•	•		, ,	760
2 per cent Contingencies	•	•			· N	•	•	•	•	•		
TIT DOMESTI YOUR WINDS					1.1	Tot	al To	ols and	i Plan	t	. 4,46,	760
III. ESTABLISHMENT Establishment for 4 years in	aludina	outah	lighen	nh oc	ntinge	nelea					. 23,09,	588
Establishment for a years in	ciquing	1		AT I		110100		٠			<del></del>	
		- V					Ģ	rand T	otal	•	. 95,91,	,144
I. WORKS			तदां	n a	etails							
Dams and Appurtenant Wo	rks		1 -1	1 ,	,					•		
· ·	A. Pr	olimi	ngru	Erne	ngag							
1. Survey of reservoir basin			•	-		A ~=	ound	011777	9 17 9 Y		olotting con	ton
.—5 ft. intervals on a scale of	1″—1	nilo milo	потоб	րարո	y an	u gi	Ountu	Sul V	у ви		Nothing con	JUG
1. Ghugri Dam	£ -— 1	щи.									50 sq. mile	R
2. Bilghra	•	• •	•	•	•	•	•	•	•	•	0.4.0	
3. Bargi	•	•	•	•	•	•	•	•	•	•	07	
_	•	•	•	•	•	•	•	•	•	•	190	
4. Tawa	•	•	•	•	•	•	•	•	٠,	•		
5. Hoshangabad	•	•	,	•	•	•	•	•	•	•	25 (Approx	E.)
6. Punasa	•	•	•	•	•	•	•	•	•	•	500 ,,	
7. Harinphal ,	•	•	•	•	•	•	•	•	•	٠	140 ,,	
<del>-</del>	Tarinnh	al .	•	•	•	•	•	•	•	•	25 ,,	
8. Dam site between Punasa and H											1 5	
<del>-</del>		•	•	•	•	•	•	•	• .	•	15 "	
8. Dam site between Punasa and H		•	•	•	٠	•	•	•	•	•	15 ,,	

1031.8 Sq. miles at Rs. 375 per sq. mile

Rs. 3,87,000.

2. Survey of Dam sites and Weir sites by air photography and ground surveys and plotting on a scale of 32"=1 mile.

7500 acres at Rs. 4 per acre

Rs. 30,000

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Chugsi.	•	•	•	-	•	•	•	•	•	•	•	•	•	•	- '	. 50	,
Bargi .	•	•	•	•	•	•	•	•	•	•	•	•	•	•		. 5:	a
Tawa .	·	Ĭ	Ċ	·	•	•		•	•	•		•	•	•		. 30	. "
Punasa	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	100	, ,
Haringhal	•	•	•	•	•	•	•.	•	•	•	•	•	•	•	•	. 20	` "
Hoshangal	orl	•	•	•	•	•	•	•,	•	•	•	•	•	•		32	, ''
Dam site b		· Dans		nd H	. risesti	al a	•	•	•	•	•	•	•	•	•		
2 Dam sito					ai i ii pi	C.	•	•	•	•	•	•	•	•		. 27 . 50	,
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æ							K. L	Buildi:	ngs								
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		-															9,74,000
II. Main								450	STEP.								
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		ls ex-	_		•	•	Gill		2.66	500	•	•	•	٠			18,00,000 acres
		s ex-T			•	•	1				•	•	•	•		_	11,00,000 ,,
	Cana	ls ex-	uroa	ch .	•	•	· (2)				•	•	•	•			10,00,000 ,,
							16			77						3	9,00,000 acros
																	Rs.
39,00,0	00 acre	as @ 1	Rs. 1	/2 per	acro											. 4	13,87,500
(b)	Misce	llane	ous si	urvey	s .		.00		134	Eq.			•		L.		20,000
(0)	Explo	ratio	ıs for	foun	dation	ıs of	cross	drain	ago w	orks a	nd no	cessar	y surv	eys	L.S	· .	1,00,000
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Equipm sol Rocurri 15 obse V. Mineral VI. Survey II. Malarid II. Electric	Surve for Pi a Surve load S	it Rs. ys L. sciculi eys L. furvey	15 p S. ure I S. s L.	L. S. S.		·. ·	•	•.	•	•	• **	•	•	•		•	2,000 5,000 10,000
Equipm sol rate Rocurri 15 obsevent V. Mineral VI. Survey II. Malari II. Electric K. Surveys	Surve for Pi a Surv load S	it Rs.  ys L.  sciculi  eys L.  urvey  vigati	S. fure I S. s L. s	L. S. S.	•	·. · · · · · · · · · · · · · · · · · ·		•.	•		• •	•	•	•		•	2,000 5,000 10,000 1,00,000
Equipm sol Rocurri 15 obse  V. Mineral VI. Survey II. Malari II. Electric K. Surveys X. Econom	ing Extroors a Surve for Pica Surve load Surve load S for Notice and	t Rs. ys L. sciculi eys L. urvey vigati prope	S. S. S. S. S. S. L. S. S. Con L. Criy S.	L. S. S. . S. urvey	•	•.		•	•		•	•	•	•		•	1,000 10,000 1,00,000 60,000
Equipm sol rate Rocurri 15 obsevent V. Mineral VI. Survey II. Malari II. Electric K. Surveys	ing Extroors a Surve for Pica Surve load Surve load S for Notice and	t Rs. ys L. sciculi eys L. urvey vigati prope	S. S. S. S. S. S. L. S. S. Con L. Criy S.	L. S. S. . S. urvey	•	•.		•	•	•	•	•	•	•		•	2,000 5,000 10,000 1,00,000

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II, Special Tools and Plan	it											Ra.
6 Diamond drills comple		0008901	ries a	Rs.	60,000	oach						3,60,000
Tosting apparatus and la								pres	sive s	trengt	h of	2,00,000
recks and testing soi	ils for she	ear str	ength	, opti	mum :	noisti •	uro eo	ntent	and	conso	lida• •	1,00,000
											_	4,60,000
												67,00,800
2% Contingencies .	•	•		• •	• •			•	•	•	•	1,34,016
					T	otal V	Vorks	_			. –	68,34,816
II. TOOLS AND PLANT	1						,	•	•	•	•	00,01,010
1. Motor vehicles for	survey p	artios		•	•			•			• •	••
14 vohicles at Rs. 7	7,000 eacl	h.									••	98,000
Working expenses:	for four y	oars.						•				1,40,000
2. Sciontific Instrume	nts .											1,20,000
3. Ordinary Tools and	Plant						• .					10,000
4. Camp equipage								_				30,000
5. Office furniture								Ċ	·		·	40,000
				•	•	•	•	•	•	•	٠.	
2% Contingencies .		•		•	•		•					4,38,000 8,760
III. ESTABLISHMENT.					T	otal T	oola a	nd P	lant			4,46,760
III. ESTABLISHMENT.				477	totan.	·					E,	penditure pe
1. Pay of Officers—			1	14	Little	2						Rs.
Executive Engineers 2 N	[00 @ Re	. 875 .	45.1			经的						
										•	•	21,000
		•	20.000	600 2		O. P.	·					00.000
Assistant Executive Eng	ineors 4 N	Nos. @	Rs.	800 <b>p</b> .	m.			•	•		•	28,800
Assistant Executive Eng Assistant Engineers 4 No	ineors 4 Nos. @ Rs.	Nos. @	Rs.	800 р.	m.		•	•	•	•	•	26,880
Assistant Executive Eng Assistant Engineers 4 No Geologist 1 No. @ Rs. 8	ineors 4 Nos. @ Rs. 75 p.m.	Nos. @	Rs.	800 р.	m.		•	•	•	•	•	26,880 10,500
Assistant Executive Eng Assistant Engineers 4 No Geologist 1 No. @ Rs. 8' Assistant Geologists 2 No	ineors 4 Nos. @ Rs. 75 p.m. os. @ Rs.	70s. @ 560 p	Rs. .m.				•	•	•	•	•	26,880 10,500 12,000
Assistant Executive Eng Assistant Engineers 4 No Geologist 1 No. @ Rs. 8 Assistant Geologists 2 No Officer to conduct econom	rineors 4 Mos. @ Rs. 75 p.m. os. @ Rs. nic surve	Nos. @ 560 p 500 p ys 1 N	Rs. .m.				•	•	•	•	•	26,880 10,500
Assistant Executive Eng Assistant Engineers 4 No Geologist 1 No. @ Rs. 8' Assistant Geologists 2 No	rineors 4 Mos. @ Rs. 75 p.m. os. @ Rs. nic surve	Nos. @ 560 p 500 p ys 1 N	Rs. .m.				•	•	•	•	•	26,880 10,500 12,000
Assistant Executive Eng Assistant Engineers 4 No Geologist 1 No. @ Rs. 8 Assistant Geologists 2 No Officer to conduct econom	rineors 4 Mos. @ Rs. 75 p.m. os. @ Rs. nic surve	Nos. @ 560 p 500 p ys 1 N	Rs. .m.				•	•	•	•	•	26,880 10,500 12,000 6,600 12,000
Assistant Executive Eng Assistant Engineers 4 No Geologist 1 No. @ Rs. 8 Assistant Geologists 2 No Officer to conduct econom Drill Foreman 1 No. @ F	rineors 4 M os. @ Rs. 75 p.m. os. @ Rs. mic surve Rs. 1,000	Nos. @ 560 p 500 p ys 1 N	Rs. .m.				•	•	•	•		26,880 10,500 12,000 6,600
Assistant Executive Eng Assistant Engineers 4 No Geologist 1 No. @ Rs. 8' Assistant Geologists 2 No Officer to conduct econom Drill Foreman 1 No. @ F	nineors 4 Mos. @ Rs. 75 p.m. os. @ Rs. mic survey Rs. 1,000	Nos. @ 560 p 500 p ys 1 N p.m.	Rsmm					•	•	•	:	26,880 10,500 12,000 6,600 12,000
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Assistant Executive Eng Assistant Engineers 4 No Geologist 1 No. @ Rs. 8' Assistant Geologists 2 No Officer to conduct econon Drill Foreman 1 No. @ F	gineors 4 Mos. (?) Rs. (?) Rs. 75 p.m. os. (?) Rs. mic surver Rs. 1,000 mnts (?) Rs. 200 p.m.	Nos. @ 560 p 500 p ys 1 N p.m.	Rsmm				•	•		•	•	26,880 10,500 12,000 6,600 12,000 1,17,780 Rs. 8,640
Assistant Executive Eng Assistant Engineers 4 No Geologist 1 No. @ Rs. 8' Assistant Geologists 2 No Officer to conduct econon Drill Foreman 1 No. @ F 2. Pay of Establishment— 3 Meteorological Assista 2 Accountants @ Rs. 2	gineors 4 Mos. (?) Rs. (?) Rs. 75 p.m. os. (?) Rs. mic surveins. 1,000 mnts (?) Rs. 1,000 p.m. 80 p.m.	Nos. @ 560 p 500 p ys 1 N p.m.	Rsmm			The second secon	•	•			•	26,880 10,500 12,000 6,600 12,000 1,17,780 Rs. 8,640 4,800 4,320
Assistant Executive Eng Assistant Engineers 4 No Geologist 1 No. @ Rs. 8' Assistant Geologists 2 No Officer to conduct econon Drill Foreman 1 No. @ F 2. Pay of Establishment— 3 Meteorological Assista 2 Accountants @ Rs. 2 2 Hoad clerks @ Rs. 18	nineors 4 Mos. (?) Rs. (?) Rs. (?) Rs. 75 p.m. os. (?) Rs. mic survey Rs. 1,000 ants (?) Rs. 200 p.m. 80 p.m. 150 p.m.	Nos. @ 560 p 500 p ys 1 N p.m.	Rsmm				•	•	•	•	•	26,880 10,500 12,000 6,600 12,000 1,17,780 Rs. 8,640 4,800 4,320 10,800
Assistant Executive Eng Assistant Engineers 4 No Geologist 1 No. @ Rs. 8' Assistant Geologists 2 No Officer to conduct econom Drill Foreman 1 No. @ F 2. Pay of Establishment— 3 Meteorological Assista 2 Accountants @ Rs. 2 2 Hoad clerks @ Rs. 18 6 Senior clerks @ Rs. 1	neors 4 Mos. @ Rs. 75 p.m. os. @ Rs. nic survey Rs. 1,000 mnts @ R. 200 p.m. 80 p.m. 150 p.m. 50 p.m.	Nos. @ 560 p 500 p ys 1 N p.m.	Rsmm			The state of the s	•	•	•	•	•	26,880 10,500 12,000 6,600 12,000 1,17,780 Rs. 8,640 4,800 4,320 10,800 3,600
Assistant Executive Eng Assistant Engineers 4 No Geologist 1 No. @ Rs. 8' Assistant Geologists 2 No Officer to conduct econom Drill Foreman 1 No. @ F 2. Pay of Establishmont— 3 Meteorological Assista 2 Accountants @ Rs. 2 2 Hoad clerks @ Rs. 18 6 Senior clerks @ Rs. 1 2 Storokeepers @ Rs. 1 14 Junior clerks @ Rs. 9	nineors 4 Mos. @ Rs. 75 p.m. os. @ Rs. nic survey Rs. 1,000 mnts @ Rs. 1000 p.m. 80 p.m. 150 p.m. 50 p.m. 50 p.m.	Nos. @ 560 p 500 p ys 1 N p.m.	Rsmm			市	•	• • • • • • • • • • • • • • • • • • • •	•	•	•	26,880 10,500 12,000 6,600 12,000 1,17,780 Rs. 8,640 4,800 4,320 10,800 3,600 15,624
Assistant Executive Eng Assistant Engineers 4 No Geologist 1 No. @ Rs. 8' Assistant Geologists 2 No Officer to conduct econom Drill Foreman 1 No. @ F 2. Pay of Establishment— 3 Meteorological Assista 2 Accountants @ Rs. 2 2 Hoad clerks @ Rs. 18 6 Senior clerks @ Rs. 1 2 Storokeepers @ Rs. 1 14 Junior clerks @ Rs. 9 2 Sonior Draftsmen @ R	nineors 4 Mos. @ Rs. 75 p.m. os. @ Rs. nic survey Rs. 1,000 ants @ Rs. 1000 p.m. 80 p.m. 150 p.m. 50 p.m. Rs. 200 p.m. Rs. 200 p.m.	Nos. @ 560 p . 500 p ys 1 N p.m. s. 240	Rsmm				•	• • • • • • • • • • • • • • • • • • • •	•	•	•	26,880 10,500 12,000 6,600 12,000 1,17,780 Rs. 8,640 4,800 4,320 10,800 3,600 15,624 4,800
Assistant Executive Eng Assistant Engineers 4 No Geologist 1 No. @ Rs. 8' Assistant Geologists 2 No Officer to conduct econom Drill Foreman 1 No. @ F 2. Pay of Establishment— 3 Meteorological Assista 2 Accountants @ Rs. 2 2 Hoad clerks @ Rs. 18 6 Senior clerks @ Rs. 1 2 Storokeepers @ Rs. 1 14 Junior clerks @ Rs. 9 2 Sonior Draftsmen @ 1 4 Junior Draftsmen @	nineors 4 Mos. @ Rs. 75 p.m. os. @ Rs. nic survey Rs. 1,000 mnts @ Rs. 1000 p.m. 150 p.m. 150 p.m. 150 p.m. Rs. 200 p.m. Rs. 200 p.m. Rs. 200 p.m. Rs. 200 p.m.	Nos. @ 560 p . 500 p ys 1 N p.m. s. 240	Rsmm			The state of the s	•	• • • • • • • • • • • • • • • • • • • •			•	26,880 10,500 12,000 6,600 12,000 1,17,780 Rs. 8,640 4,800 4,320 10,800 3,600 15,624 4,800 3,432
Assistant Executive Eng Assistant Engineers 4 No Geologist 1 No. @ Rs. 8' Assistant Geologists 2 No Officer to conduct econom Drill Foroman 1 No. @ F  2. Pay of Establishmont— 3 Meteorological Assista 2 Accountants @ Rs. 2 2 Hoad clerks @ Rs. 18 6 Senior clerks @ Rs. 1 2 Storokeepers @ Rs. 1 14 Junior clerks @ Rs. 9 2 Sonior Draftsmon @ 1 4 Junior Draftsmon @ 1 4 Tracers @ Rs. 104 p.n	nineors 4 Mos. @ Rs. 75 p.m. os. @ Rs. 75 p.m. os. @ Rs. mic survey Rs. 1,000  ants @ R. 200 p.m. 150 p.m. 150 p.m. 150 p.m. Rs. 200 p.m. Rs. 200 p.m.	Nos. @ 560 p	Rs			1 The state of the	•	•			•	26,880 10,500 12,000 6,600 12,000 1,17,780 Rs. 8,640 4,800 4,320 10,800 3,600 15,624 4,800 3,432 4,992
Assistant Executive Eng Assistant Engineers 4 No Geologist 1 No. @ Rs. 8' Assistant Geologists 2 No Officer to conduct econom Drill Foreman 1 No. @ F.  2. Pay of Establishment—  3 Meteorological Assista 2 Accountants @ Rs. 2 2 Hoad clerks @ Rs. 18 6 Senior clerks @ Rs. 18 2 Storokeepers @ Rs. 1 14 Junior clerks @ Rs. 9 2 Sonior Draftsmen @ 14 Junior Draftsmen @ 14 Tracers @ Rs. 104 p.r. 2 Sub Assistant Surgeon	nineors 4 Mos. @ Rs. 75 p.m. os. @ Rs. nic survey Rs. 1,000 mn. 80 p.m. 150 p.m. 150 p.m. 150 p.m. Rs. 200 p.	Nos. @ 560 p	Rs			i i i i i i i i i i i i i i i i i i i	•	•		•	•	26,880 10,500 12,000 6,000 12,000 1,17,780 Rs. 8,640 4,800 4,320 10,800 3,600 15,624 4,800 3,432 4,992 4,080
Assistant Executive Eng Assistant Engineers 4 No Geologist 1 No. @ Rs. 8' Assistant Geologists 2 No Officer to conduct econom Drill Foreman 1 No. @ F.  2. Pay of Establishment—  3 Meteorological Assistant 2 Accountants @ Rs. 2' Hoad clerks @ Rs. 18' 6 Senior clerks @ Rs. 18' 2 Storokeepers @ Rs. 11' Junior clerks @ Rs. 11' Junior clerks @ Rs. 9' 2 Senior Draftsmen @ 14' Junior Draftsmen @ 14' Tracers @ Rs. 104' p.r. 2 Sub Assistant Surgeon 2 Compounders @ Rs. 5'	nineors 4 Mos. @ Rs. 75 p.m. os. @ Rs. 75 p.m. os. @ Rs. mic survey Rs. 1,000  ants @ Rs. 1,000  ants @ Rs. 1,000  ants @ Rs. 1,000  Rs. 200 p.m. Rs. 200 p Rs. 143 p m. as @ Rs.	Nos. @ 560 p	Rs			T	•	•			•	26,880 10,500 12,000 6,600 12,000 1,17,780 Rs. 8,640 4,800 4,320 10,800 3,600 15,624 4,800 3,432 4,992 4,080 1,200
Assistant Executive Eng Assistant Engineers 4 No Geologist 1 No. @ Rs. 8' Assistant Geologists 2 No Officer to conduct econom Drill Foreman 1 No. @ F.  2. Pay of Establishment— 3 Meteorological Assistant 2 Accountants @ Rs. 2 2 Hoad clerks @ Rs. 18 6 Senior clerks @ Rs. 18 2 Storokeepers @ Rs. 11 Junior clerks @ Rs. 11 Junior clerks @ Rs. 9 2 Sonior Draftsmen @ 4 Junior Draftsmen @ 4 Tracers @ Rs. 104 p.m. 2 Sub Assistant Surgeon 2 Compounders @ Rs. 53 2 Overseers @ Rs. 240 p.m.	nineors 4 Mos. @ Rs. 75 p.m. os. @ Rs. nic survey Rs. 1,000 p.m. 80 p.m. 150 p.m. 150 p.m. Rs. 200 p Rs. 143 p m. ns @ Rs. 150 p.m. p.m. p.m.	Nos. @ 560 p 560 p ys 1 N p.m.	Rs			T	•	• • • • • • • • • • • • • • • • • • • •			•	26,880 10,500 12,000 6,600 12,000 1,17,780 Rs. 8,640 4,800 4,320 10,800 3,600 15,624 4,800 3,432 4,992 4,080 1,200 92,160
Assistant Executive Eng Assistant Engineers 4 No Geologist 1 No. @ Rs. 8' Assistant Geologists 2 No Officer to conduct econom Drill Foreman 1 No. @ F.  2. Pay of Establishment— 3 Meteorological Assistant 2 Accountants @ Rs. 2 2 Hoad clerks @ Rs. 18 6 Senior clerks @ Rs. 18 2 Storokeepers @ Rs. 1 14 Junior clerks @ Rs. 1 2 Sonior Draftsmen @ 4 Junior Draftsmen @ 4 Tracers @ Rs. 104 p.n 2 Sub Assistant Surgeon 2 Compounders @ Rs. 5 3 2 Overseers @ Rs. 240 6 Rosearch Assistants @	nineors 4 Mos. (?) Rs. (?) Rs. (?) Rs. (?) Rs. nic survey Rs. 1,000 mnts (?) Rs. 1,000 p.m. 150 p.m. 150 p.m. 143 pm. Rs. 200 pm. 143 pm. 150 p.m. 150 Rs. 240	Nos. @ 560 p 560 p ys 1 N p.m. s. 240	P.R.S			1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	•	• • • • • • • • • • • • • • • • • • • •			•	26,880 10,500 12,000 6,600 12,000 1,17,780 Rs. 8,640 4,800 4,320 10,800 3,600 15,624 4,806 3,432 4,992 4,080 1,200 92,160 17,280
Assistant Executive Eng Assistant Engineers 4 No Geologist 1 No. @ Rs. 8' Assistant Geologists 2 No Officer to conduct econom Drill Foroman 1 No. @ F  2. Pay of Establishmont— 3 Meteorological Assista 2 Accountants @ Rs. 2 2 Hoad clerks @ Rs. 18 6 Senior clerks @ Rs. 1 2 Storokeepers @ Rs. 1 14 Junior clerks @ Rs. 9 2 Sonior Draftsmen @ 1 4 Junior Draftsmen @ 1 4 Tracers @ Rs. 104 p. 2 Sub Assistant Surgeon 2 Compounders @ Rs. 5 32 Overseers @ Rs. 240 p 6 Rosearch Assistants @ 2 Luboratory Assistants	nineors 4 Mos. (?) Rs. (?) Rs. (?) Rs. (?) Rs. nic survey Rs. 1,000 mnts (?) Rs. 1,000 mnts (?) Rs. 200 p.m. 150 p.m. 163 p.m. Rs. 200 p.m. 165 p.m	Nos. @ 560 p 560 p ys 1 N p.m. s. 240	P.R.S			T					•	26,880 10,500 12,000 6,000 12,000 1,17,780 Rs. 8,640 4,800 4,320 10,800 3,600 15,624 4,800 3,432 4,992 4,080 1,200 92,160
Assistant Executive Eng Assistant Engineers 4 No Geologist 1 No. @ Rs. 8' Assistant Geologists 2 No Officer to conduct econom Drill Foroman 1 No. @ F.  2. Pay of Establishment— 3 Meteorological Assistant 2 Accountants @ Rs. 2 2 Hoad clerks @ Rs. 18 6 Senior clerks @ Rs. 18 2 Storokeepers @ Rs. 1 14 Junior clerks @ Rs. 1 2 Sonior Draftsmen @ 4 Tracers @ Rs. 104 p.n 2 Sub Assistant Surgeon 2 Compounders @ Rs. 5 3 2 Overseers @ Rs. 240 1 6 Rosearch Assistants @ Laboratory Assistants 2 Silt-Analysts @ Rs. 2	nineors 4 Mos. (?) Rs. (?) Rs. (?) Rs. (?) Rs. (?) Rs. 1,000 Rs. 1,000 Rs. 1,000 P.m. (?) Rs. 240 P.m. (?) Rs. 240 P.m.	Nos. @ 560 p	P.R.S			1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -					•	26,880 10,500 12,000 6,600 12,000 1,17,780 Rs. 8,640 4,800 4,320 10,800 3,600 15,624 4,806 3,432 4,992 4,080 1,200 92,160 17,280
Assistant Executive Eng Assistant Engineers 4 No Geologist 1 No. @ Rs. 8' Assistant Geologists 2 No Officer to conduct econom Drill Foroman 1 No. @ F.  2. Pay of Establishmont— 3 Meteorological Assistant 2 Accountants @ Rs. 2 2 Hoad clerks @ Rs. 18 6 Senior clerks @ Rs. 1 2 Storokeepers @ Rs. 1 14 Junior clerks @ Rs. 9 2 Sonior Draftsmon @ 4 Junior Draftsmon @ 4 Tracers @ Rs. 104 p.n 2 Sub Assistant Surgeon 2 Compounders @ Rs. 5 3 2 Overseers @ Rs. 240 1 6 Rosearch Assistants @ 2 Laboratory Assistants 2 2 Assistant Silt Analysts	nineors 4 Nos. (?) Rs. (?) Rs. (?) Rs. (?) Rs. 1,000 Rs. 1,000 Rs. 1,000 Rs. 1,000 p.m. 150 p.m. 150 p.m. 150 p.m. 183 p.m. 183 p.m. 183 p.m. 183 p.m. 185 p	Nos. @ 560 p	P.R.S			1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -		•••••••••••••			• • • • • • • • • • • • • • • • • • • •	26,880 10,500 12,000 6,600 12,000 1,17,780 Rs. 8,640 4,800 4,320 10,800 3,600 15,624 4,800 3,432 4,992 4,080 1,200 92,160 17,280 5,520
Assistant Executive Eng Assistant Engineers 4 No Geologist 1 No. @ Rs. 8' Assistant Geologists 2 No Officer to conduct econom Drill Foroman 1 No. @ F  2. Pay of Establishmont— 3 Meteorological Assista 2 Accountants @ Rs. 2 2 Hoad clerks @ Rs. 18 6 Senior clerks @ Rs. 1 2 Storokeepers @ Rs. 1 14 Junior clerks @ Rs. 9 2 Sonior Draftsmon @ 1 4 Junior Draftsmon @ 1 4 Tracers @ Rs. 104 p.n 2 Sub Assistant Surgeon 2 Compounders @ Rs. 5 32 Overseers @ Rs. 240 p 6 Rosearch Assistants @ 2 Laboratory Assistants 2 Silt-Analysts @ Rs. 2 2 Assistant Silt Analyst 10 Gauge readers @ Rs.	nineors 4 Mos. (?) Rs. (?) Rs. (?) Rs. (?) Rs. (?) Rs. 1,000 Rs. 1,000 Rs. 1,000 p.m. 80 p.m. 150 p.m. 155 p.m. 155 (?) Rs. 240 p.m. 155 (?) Rs. 270 p.m. 155 (?) Rs. 270 p.m.	Nos. @ 560 p 560 p 500 p ys 1 N p.m. s. 240	P.R.S			1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -		•••••••••••••••••				26,880 10,500 12,000 6,600 12,000 1,17,780 Rs. 8,640 4,800 4,320 10,800 3,600 15,624 4,800 3,432 4,992 4,080 1,200 92,160 17,280 5,520 4,800
Assistant Executive Eng Assistant Engineers 4 No Geologist 1 No. @ Rs. 8' Assistant Geologists 2 No Officer to conduct econom Drill Foroman 1 No. @ F.  2. Pay of Establishmont— 3 Meteorological Assistant 2 Accountants @ Rs. 2 2 Hoad clerks @ Rs. 18 6 Senior clerks @ Rs. 18 2 Storokeepers @ Rs. 1 14 Junior clerks @ Rs. 1 2 Sonior Draftsmon @ 4 Junior Draftsmon @ 4 Tracers @ Rs. 104 p.m 2 Sub Assistant Surgeon 2 Compounders @ Rs. 5 3 2 Overseers @ Rs. 240 1 6 Rosearch Assistants @ Laboratory Assistants 2 Silt-Analysts @ Rs. 2 Assistant Silt Analyst 10 Gauge readers @ Rs. 10 Senior Observers @ F.	nineors 4 Nos. (?) Rs. (?) Rs. (?) Rs. (?) Rs. nic surve; Rs. 1,000 nnts (?) Rs. 1,000 nnts (?) Rs. 200 p.m. 150 p.m. 150 p.m. 150 p.m. 18s. 200 p.m. 18s. 200 p.m. 18s. 240 p.m. 18s. 2	Nos. @ 560 p 560 p 500 p ys 1 N p.m. s. 240	P.R.S					••••••••••••••••••••			• • • • • • • • • • • • • • • • • • • •	26,880 10,500 12,000 6,600 12,000 1,17,780 Rs. 8,640 4,800 4,320 10,800 3,600 15,624 4,800 3,432 4,992 4,080 1,200 92,160 17,280 5,520 4,800 2,232 8,400
Assistant Executive Eng Assistant Engineers 4 No Geologist 1 No. @ Rs. 8' Assistant Geologists 2 No Officer to conduct econom Drill Foroman 1 No. @ F  2. Pay of Establishmont— 3 Meteorological Assista 2 Accountants @ Rs. 2 2 Hoad clerks @ Rs. 18 6 Senior clerks @ Rs. 1 2 Storokeepers @ Rs. 1 14 Junior clerks @ Rs. 9 2 Sonior Draftsmon @ 1 4 Junior Draftsmon @ 1 4 Tracers @ Rs. 104 p.n 2 Sub Assistant Surgeon 2 Compounders @ Rs. 5 32 Overseers @ Rs. 240 p 6 Rosearch Assistants @ 2 Laboratory Assistants 2 Silt-Analysts @ Rs. 2 2 Assistant Silt Analyst 10 Gauge readers @ Rs.	nineors 4 Nos. (?) Rs. (?) Rs. (?) Rs. (?) Rs. nic surve; Rs. 1,000 nnts (?) Rs. 1,000 nnts (?) Rs. 200 p.m. 150 p.m. 150 p.m. 150 p.m. 18s. 200 p.m. 18s. 200 p.m. 18s. 240 p.m. 18s. 2	Nos. @ 560 p 560 p 500 p ys 1 N p.m. s. 240	P.R.S					••••••••••••••••••••				26,880 10,500 12,000 6,600 12,000 1,17,780 Rs. 8,640 4,800 4,320 10,800 3,600 15,624 4,800 3,432 4,992 4,080 1,200 92,160 17,280 5,520 4,800 2,232

	14 Peons @ Rs. 33 p.m												Rs. 5,545
	6 Laboratory Khalasis @ Rs. 33 p.m.								•				2,376
	10 Chowkidars @ Rs. 33 p.m	•	•		•	٠	•	•		•	•		3,960
										Total			2,24,112
3.	Dearnoss allowances of Officers.												16,020
4.	Dearness allowances for establishmen	t											66,480
5.	Travelling allowances for Officers												40,000
6.	Travelling allowances for establishmen	t											60,000
7.	Cost of project Circle office debited to	Narba	da										33,000
8.	Establishment contingencies .												20,000
					E	stabli	shmer	nt per	year				5,77,392
	Grand Total	-Esta	ablisi	men	t for	4 yea	rs.						23,09,568
												-	

G. N. Pandit,
Project Officer (Narbada & Tapti).



II. Estimate for preliminary surveys and investigations in connection with projects for multipurpose development in the Basin of the Narbada River for the year 1947-48 submitted to Government for sanction.

I. WORKS										
Dams and appurtenant works										_
(i) Preliminary expenses										Rs.
(ii) Survey to be carried out by the Survey of Indi					•	•	٠	L.S.		2,500
1. Survey to be carried out by or under the di		ns of (	c.w.	I.N.C.	•	•	•	L.S.		14,00
2. Discharge and silt observations	•	٠	٠	•	•	•		L.S.		1,990
<ol> <li>Geological investigations and mineral surve</li> </ol>	эув	•	•	•	•	•	•	L.S.		1,000
4. Communications	•	•	•	•		•	•	L.S.		10,000
5. Contingencies at 2 per cent	•	•	٠	•		•				650
			To	tał W	orks					30,140
II. TOOLS AND PLANT										
(Including transport, conveyance and its carriage camp equipage, silt, observation apparatus, etc.)	and r	repair	cha	rges,	surve	y and	ma	themai	tical	instrumen <b>t</b>
(a) New Supplies										Rs.
9 Weapon carriers @ Rs. 7,000 each										63,000
3 Jeeps with trailers @ Rs. 7,000 each										21,000
2 Chronographs @ Rs. 100 each										200
2 current meters @ Rs. 1,000 each	•	•	•	•						2,000
2 largo boats @ Rs. 1,000 each f				•						2,000
2 small boats @ Rs. 500 oach		5.2								1,000
Dischargo rods	legal I		) .							200
Sounding rods		10000								100
Ropes										500
One set of apparatus for silt observations @ Rs.	1.500	ouch a	nd r	main	ng lal	orato	rv ec	uiome	ent	2,200
(b) Repairs and Carriago	1. 2.1	71			0					_,
Repairs to trucks etc	4.11	Li.								1,500
	100			N 4						<del></del> -
Grand Tot	aroti	, " " ", r 0013 £	ına ı	runt	•	•	٠	•	•	93,700
III. ESTABLISHMENT	200	And a second								
(a) Pay of Officers	ग्रेव ज	गर्न								•
2 Executive Engineers for 3 months @ Rs. 90		9 1								z 400
4 Assistant Engineers for 3 months @ Rs. 350	-		•	•	•	•	•	•	•	5,400
	, p.m.	•	•	•	•	•	•	•	•	4,200
1 Geologist for 3 months @ Rs. 600 p.m	•	•	•	•	•	•	•	•	•	1,800
							T	otal	•	11,400
Pay of establishment										
11 Overseers for 3 months @ Rs. 180 p.m		•								5,940
2 Accountants for 3 months @ Rs. 200 p.m	•			•		•		•		1,200
2 Head clorks for 3 months @ Rs. 160 p.m		•					٠		÷	960
1 Sub-Assistant Surgeon for 2 months @ Rs. 200	p.m.					•		•		400
3 clerks for 3 months @ Rs. 80 p.m	•									720
4 Sub-Divisional clerks for 3 months @ Rs. 75 p.	m.								•	900
1 Head Draftsman for 3 months @ Rs. 250 p.m.								•		750
2 Junior Draftsmen for 3 months @ Rs. 100 p.m.	•	•		•						600
4 Tracers for 3 months @ Rs. 80 p.m						•				960
1 Dispenser for 2 months @ Rs. 80 p.m.										160
1 Daffadar for 2 months @ Rs. 35 p.m.										70
			-					-	*	270
3 Barkandazes for 3 months @ Rs. 30 p.m.										
3 Barkandazes for 3 months @ Rs. 30 p.m 7 Peons for 3 months @ Rs. 30 p.m	•		•	•	•	,	•	•		630

4 Feoms for 8-months @:Re. 20 p	<b>хт.</b> .						٠.					R <sub>8</sub>
5 Chowkiders for 3 months @ R												450
4 Dak runners for 3 months @ F		•										360
11 Khalasis for overseers for 3 m	onth	8 @ R	. 30	p.m								990
7 Gauge readers for 3 months @	Rs.	30 p.m.		•								630
Geologiat-staff-L. S	•		•	•	•		•	•	•	•		.1,000
											_	17,350
Dearness allowance and Special p	ay of	Office	rs L.	<b>S.</b> .							•	1,150
Dearness allowance of establishm	ent L	8		•	•	•		•	•	•		7,000
Travelling allowance for officers												
1. Executive Engineers												1,400
2. Assistant Engineers												1,800
3. Geologists	•	•	•	. '	•	•		•		•	•	1,000
												4,200
Travelling Allowance of Establishment												
Supervisors		•	•									2,000
Other staff (Executive Engineers)		•			•							2,000
Geologist—Other Staff	•	•	•	. •	•	•	•	•	•	•		400
			EŽ.	THEO.							-	4,400
(b) Establishment Contingencies		En	1	LC.	0							
Rent for Divisional and Sub-Divi	sions	I Office	38 .	201					•			1,000
Rent for Geologista' Offices .	•	A.				•		٠	•		•	400
		18	帰									1,400
			Gı	a ret has			blishm	ent		•	•	46,900
I. Works	•	150	10	151,150	0,140							
TI. Tools and Plant	•	1	•		3,700							
III. Establishment	٠.	(C)		Q=:\	8,900	_						
	1	Cotal	-	1,7	0,740							
		-	JEJ N	A	e e	-						

G. N. PANDIT,
Project Officer, (Narbada and Tapti).

III. Estimate for the preliminary surveys and investigation in connection with the project for multipurpose developments in the Basin of the Narbada River for the year 1948-49, submitted to Government for sanction.

#### I. WORKS

I. WORKS		
1. Dams and appurtenant works. (A—Preliminary expenses)		Rs,
Survey to be carried out by the Survey of India	. L.S.	3,00,00
Survey to be carried out by or under the direction of C.W.I.N.C	. L.S.	20,00
K. Buildings	. J.S.	50,00
2. Main canal and branches		•
Miscellaneous surveys such as canal alignments, special reservoir surveys, etc	. L.S.	40,00
Soil surveys	. L.S.	70,00
3. Meteorological surveys		
Rain gauges—It is proposed to install 70 new rain gauges (i) Equipment and installation of gauges—70 new rain gauges including temperature, humidity and wind velocity apparatus at 35 places and some self-recording gauges at an average rate of Rs. 500 each	35,000	
(ii) Observation Expenditure per year		
3 Meteorological Assistants @ Rs. 200 p.m.	7,200	
3 Senior Observers @ Rs. 120 p.m	4,320	
70 part time Observers @ Rs. 15 p.m.	12,600	
70 part time Retainers @ Rs. 12 p.m	10,080	
	34,220	69,000 (say)
5 Geological investigations and mineral surveys	. L.S.	20,000
6 Communications.	L.S.	50,000
7 Special Tools and Plant (Drill equipment and apparatus for soil laboratory)	. L.S.	12,00,000
8 Economic surveys	. L.S.	6,000
9 Hydro Electric Installations—A. preliminary expenses—Electric Load surveys .	L.S.	5,000
10 Contingencies @ 2%		61,000
Total-Works		19,41,000
: TOOLS AND PLANTS		
7 country boats @ Rs. 1,000 each		7,000
7 country boats @ Rs. 1,000 each		7,000 3,000
•		3,000
3 outboard motors @ Rs. 1,000 each		3,000 1,600
3 outboard motors @ Rs. 1,000 each		3,000 1,600 14,400
3 outboard motors @ Rs. 1,000 each		3,000 1,600 14,400
3 outboard motors @ Rs. 1,000 each		3,000 1,600 14,400 4,500
3 outboard motors @ Rs. 1,000 each 16 chronographs at Rs. 100 each 18 levelling instruments at Rs. 800 each 3 theodolites at Rs. 1,500 each 3 Binoculars at Rs. 200 each	· · · · · · · · · · · · · · · · · · ·	3,000 1,600 14,400 4,500 600
3 outboard motors @ Rs. 1,000 each 16 chronographs at Rs. 100 each 18 levelling instruments at Rs. 800 each 3 theodolites at Rs. 1,500 each 3 Binoculars at Rs. 200 each 1 camera at Rs. 600	· · · · · · · · · · · · · · · · · · ·	3,000 1,600 14,400 4,500 600
3 outboard motors @ Rs. 1,000 each 16 chronographs at Rs. 100 each 18 levelling instruments at Rs. 800 each 3 theodolites at Rs. 1,500 each 1 camera at Rs. 200 each 1 camera at Rs. 600 18 measuring chains @ Rs. 15 each	· · · · · · · · · · · · · · · · · · ·	3,000 1,600 14,400 4,500 600 600
3 outboard motors @ Rs. 1,000 each 16 chronographs at Rs. 100 each 18 levelling instruments at Rs. 800 each 3 theodolites at Rs. 1,500 each 1 camera at Rs. 200 each 1 camera at Rs. 600 18 measuring chains @ Rs. 15 each 60—100 ft. tapes at Rs. 30 each	· · · · · · · · · · · · · · · · · · ·	3,000 1,600 14,400 4,500 600 600 270 1,800
3 outboard motors @ Rs. 1,000 each 16 chronographs at Rs. 100 each 18 levelling instruments at Rs. 800 each 3 theodolites at Rs. 1,500 each 1 camera at Rs. 200 each 1 camera at Rs. 600 18 measuring chains @ Rs. 15 each 60—100 ft. tapes at Rs. 30 each 60—50 ft. tapes at Rs. 20 each	· · · · · · · · · · · · · · · · · · ·	3,000 1,600 14,400 4,500 600 270 1,800 1,200
3 outboard motors @ Rs. 1,000 each 16 chronographs at Rs. 100 each 18 levelling instruments at Rs. 800 each 3 theodolites at Rs. 1,500 each 3 Binoculars at Rs. 200 each 1 camera at Rs. 600 18 measuring chains @ Rs. 15 each 60—100 ft. tapes at Rs. 30 each 7 steel tapes @ Rs. 100	· · · · · · · · · · · · · · · · · · ·	3,000 1,600 14,400 4,500 600 270 1,800 1,200
3 outboard motors @ Rs. 1,000 each 16 chronographs at Rs. 100 each 18 levelling instruments at Rs. 800 each 3 theodolites at Rs. 1,500 each 3 Binoculars at Rs. 200 each 1 camera at Rs. 600 18 measuring chains @ Rs. 15 each 60—100 ft. tapes at Rs. 30 each 60—50 ft. tapes at Rs. 20 each 7 steel tapes @ Rs. 100 7 drawing boards at Rs. 30 each	· · · · · · · · · · · · · · · · · · ·	3,000 1,600 14,400 4,500 600 270 1,800 1,200 700 210
3 outboard motors @ Rs. 1,000 each 16 chronographs at Rs. 100 each 18 levelling instruments at Rs. 800 each 3 theodolites at Rs. 1,500 each 3 Binoculars at Rs. 200 each 1 camera at Rs. 600 18 measuring chains @ Rs. 15 each 60—100 ft. tapes at Rs. 30 each 60—50 ft. tapes at Rs. 20 each 7 steel tapes @ Rs. 100 7 drawing boards at Rs. 30 each 7 2nd class drawing instrument boxes @ Rs. 200 each	· · · · · · · · · · · · · · · · · · ·	3,000 1,600 14,400 4,500 600 270 1,800 1,200 700 210 1,400 600
3 outboard motors @ Rs. 1,000 each 16 chronographs at Rs. 100 each 18 levelling instruments at Rs. 800 each 3 theodolites at Rs. 1,500 each 3 Binoculars at Rs. 200 each 1 camera at Rs. 600 18 measuring chains @ Rs. 15 each 60—100 ft. tapes at Rs. 30 each 60—50 ft. tapes at Rs. 20 each 7 steel tapes @ Rs. 100 7 drawing boards at Rs. 30 each 7 2nd class drawing instrument boxes @ Rs. 200 each 2 first class drawing instrument boxes @ Rs. 300 each Scales with offsets, etc., french curves and miscellaneous scientific instruments	· · · · · · · · · · · · · · · · · · ·	3,000 1,600 14,400 4,500 600 270 1,800 1,200 700 210 1,400 600
3 outboard motors @ Rs. 1,000 each 16 chronographs at Rs. 100 each 18 levelling instruments at Rs. 800 each 3 theodolites at Rs. 1,500 each 3 Binoculars at Rs. 200 each 1 camera at Rs. 600 18 measuring chains @ Rs. 15 each 60—100 ft. tapes at Rs. 30 each 60—50 ft. tapes at Rs. 20 each 7 steel tapes @ Rs. 100 7 drawing boards at Rs. 30 each 2 first class drawing instrument boxes @ Rs. 200 each 2 first class drawing instrument boxes @ Rs. 300 each Scales with offsets, etc., french curves and miscellaneous scientific instruments and tools and plant		3,000 1,600 14,400 4,500 600 270 1,800 1,200 700 210 1,400 600
3 outboard motors @ Rs. 1,000 each 16 chronographs at Rs. 100 each 18 levelling instruments at Rs. 800 each 3 theodolites at Rs. 1,500 each 3 Binoculars at Rs. 200 each 1 camera at Rs. 600 18 measuring chains @ Rs. 15 each 60—100 ft. tapes at Rs. 30 each 60—50 ft. tapes at Rs. 20 each 7 steel tapes @ Rs. 100 7 drawing boards at Rs. 30 each 2 first class drawing instrument boxes @ Rs. 200 each 2 first class drawing instrument boxes @ Rs. 300 each Scales with offsets, etc., french curves and miscellaneous scientific instruments and tools and plant 10 current meters @ Rs. 1,000 each		3,000 1,600 14,400 4,500 600 270 1,800 1,200 700 210 1,400 600

Sounding rods			•						٠.			Rs. 1,100
Ropes												2,500
I set of apparatus for silt observations												1,500
Recurring laboratory expenses .												300
15 Nos. 14'×14' tents @ Rs. 1,200 eac	h											18,000
40 Nos. 10'×10' tents @ Rs. 800 each									-			32,000
40 Nos. shouldaries at Rs. 600 each	·	·	·	Ī	·		-	·	•	·		24,000
40 servants' tents at Rs. 500 each		·	·	•	·	•	·	·	•	·	·	20,000
Camp furniture	•	•	•	•	•	•	•	•	•	•	•	58,000
Office furniture for Divisional and Sub-	Divie	ionel	offices		•	•	•	•	•	•	•	15,000
Office furniture for soil physicist's office					•	•	•	•	•	•	•	2,500
Office furniture for geologist's office				•	•	•	•	:	•	•	•	2,500
Repairs and Carriage—yearly ropairs to			•	•	•	•	•	•	•	•	•	<b>5,4</b> 20
		A.O	•	•	•	•	•	•	•	•	•	4,000
Contingencies at 2%	•	•	•	•	•	•	•	•	•	•	•	4,000
III. ESTABLISHMENT			Тота	AL—	rools :	and P	lant	•	•	•	•	2,00,000
(a) Pay of officers	e 10											03.600
2 Executive Engineers at Rs. 900 p.m.				•	•	•	•	•	•	•	•	21,600
8 Assistant Engineers at Rs. 350 p.m. f			ths	٠	•	•	•	•	•	•	•	33,600
1 Geologist at Rs. 600 p.m. for 12 month		•	•	٠	•	•	•	•	•	•	•	7,200
2 Assistant Geologists at Rs. 400 p.m.			ths	•	•	•	•	•	•	•	•	9,600
1 Soil Physicist at Rs. 275 p.m. for 12 :	mont	18		1		•	•	•	•	•	•	3,300
(b) Pay of establishment	- 2			24 3 / 3	ø							75,300
32 Overseers at Rs. 180 p.m. for 12 mor	ths	703			200							69,120
2 A ccountants at Rs. 200 p.m. for 12 m	onth	1 13	400		M.							4,800
2 Lead clerks at Rs. 160 p.m. for 12 mc				A.	7							3,840
2 Sub-Asstt. Surgeons at Rs. 200 p.m.:			ths									4,800
10 Clerks at Rs. 80 p.m.												9,600
16 Sub-Divisional Clerks at Rs. 75 p.m.			Street and the second									14,400
2 Head draftsmen for 12 months at Re.		0 51	21	-197	-							6,000
2 Junior draftemen for 12 months at R		120.00	99, 3.1 m	1								2,400
4 tracers for 12 months at Rs. 80 p.m.				31			Ċ					3,840
2 dispensers for 12 months at Rs. 80 p.		17.1	214		4	•						1,920
2 daffadars for 12 months at Rs. 35 p.n												840
10 barakandazes for 12 months at Rs. 3				i	·	•	•	·	•	•	•	3,600
22 peons for 12 months at Rs. 30 p.m.	-	••	•	·	•	•	•	•	•	•	•	7,920
12 peons for 12 months at Rs. 30 p.m.		•	•	•	•	•	•	•	•	•	•	
10 chowkidars for 12 months at Rs. 30		•	•	•	•	•	•	•	•	•	•	4,320
12 Dak runners for 12 months at Rs. 30	•		•	•	•	•	•	•	•	•	•	3,600
	-			•	•	•	•	•	•	•	•	4,320
32 khalasis for overseers for 12 months			р.ш.	•	•	•	•	•	•	•	•	11,520
20 gauge readers for 12 months at Rs. 3	_		•	•	•	•	•	•	•	•	•	7,200
Geologist's staff L.S	٠		•	•	•	•	•	•	•	•	•	4,000
6 sub-overseers at Rs. 50 p.m. for 12 m			•	•	•	•	•	•	•	•	•	3,600
3 Laboratory assistants at Rs. 100 p.m.		2 mo	nthe	•	•	•	•	•	•	•	•	3,600
- · · · · · · · · · · · · · · · · · · ·	•	•	•	٠	•	•	•	•	•	•	•	960
1 computer at Rs. 40 p.m. for 12 month		•	•	•	•	•	•	•	•	•	•	480
•	•	•	•	•	•	•	•	•	•	•	•	· 480
3 laboratory peons at Rs. 25 p.m. for 12		ths	•	•	• .	•	•	•	•	•	•	900
2 peons at Rs. 25 p.m. for 12 months		•	•	•	•	•	•	•	•	•	•	600
I Tapali at Rs. 25 p.m. for 12 months		•	•	•	•	•	•	•	•	•	•	300
4 Auger measures at Rs. 40 p.m. for 12												1,920

															$\mathbf{R}_{\mathbf{s}}$ .
De	arness allowance and	d spe	cial p	ay of	office	era		•				. '		•	26,420
De	arness allowance of	eetab	lishm	ent I	<b>s.</b>									•	73,000
Tra	avelling allowance of	f offic	cers											Re.	
	Executive Engine	ers											E	5,800	
	Asstt. Engineers								•				14	400	
	Geologiets .			•				•	•			•	8	3,000	
	Asstt. Geologiste				•			•	•	•		•	9	,000	
	Soil Physiciet		•	•	•	•	•	•	•	•	•		5	5,000	42,200
Tre	avelling allowance o	f este	ablieh	mont	;							_			
	Supervisors .					•			•			•	28	3,000	
	Other etaff—XEN	l'e			•	•		•			•	•	10	,000	
	Other staff (Geolo	giet)								•			1	,600	
So	oil survey staff—														
	Sub-overseers											•	2	2,000	
	Auger measures					•		•			•		2	2,000	
	Other staff .	•	•		•	•		•	•		•	•	2	2,000	45,600
(c) E	stablishment conting	genci	68									-			
	Rent for Division	al an	d Sub	o-Div	ision	al office	з.					•		4,600	
	Rent for soil phys	icist'	s offic	e and	l lab.	•		•	•			•		1,000	
	Rent for Geologist	to a'	fice	•	•	•	•	nenso.	•	•	•	•		1,600	6,600
						62/6	7	OTAL—	Esta	blish	nent	• [			4,50,000
Abstract						Carlo									
I.	Works					- 43	F.				•		19,41	1,000	
II.	Tools and Plant	•				.W			ii.	•	•		2,00	0,000	
III	Establishment	•	•		•	. 1					•		4,50	0,000	
						<u>.</u>		GRA	ND	TOTAL	£.		25,91	1,000	
						490		1000 3				-			

सव्योग ज्याने

G. N. PANDIT,

Project Officer (Narbada and Tapti).

IV. Estimate for preliminary surveys and investigations in connection with Projects for the multi-purpose development of the Narbada Basin prepared in accordance with the instructions of the ad hoc Committee.

BSTRACT		•													Rs.
1. Bargi Project .				_	_	_	_	_	_			. •			27,39,1
2. Tawa Project	•	•	•	•	•	•									15,42,6
3. Punasa Project .	•	•	•	•	•	•	•	•	-	•					7,35,3
4. Broach Project .	•	•	•	•	•	•	•	•	•	•	•				11,02,2
	•	•	•	•	•	•	•	•	•	•	•	·			37,77
5. General Surveys	•	•	•	•	•	•	•	•	•	•	•	To		•	64,97,0
												10	Say	Rs.	64,97,00
Estimate for the pr targi and on the Burhn BSTRACT	elimi ver Ri	nary iver a	surve t Ghu	ys ar Igri a	rd inv	estigo canal	ations syste	for a	lam s king	sites off f	on the om E	e No Barg.	arbada	at E	Bilgarh a
I. Works															
1. Dams and appurten	ant we	nka						,				•			
A. Preliminary ex												•		•	2,35,8
K. Buildings .	•												•	•	30,00
2. Main Canals and B	ranche	as .												•	10,98,50
3. Malaria Surveys														•	1,00
4. Electric Load Surve	eva.		·	Ì	• 1077										2,00
5. Property Surveys	J. 6	•	•		5 3/		5/5	and.							7,50
6. Communications	•	•	•	Ĭ.	- Villa			757							1,00,00
7. Special Tools and P	· ·lant	•	·		118					Ċ	·			•	1,60,00
1. Special Tools and E	IGHTV	•	•	•	160			9	•		•	ď .	4	• —	16,34,80
											2% o	ontin	gencies		32,69
					15		M.		`						16,67,49
II. Tools and Plant								7.4							2,05,53
III. Establishment .	·	·	·		No.						•	•	•	•	8,66,08
					7		ा च					To	TAL	•	27,39,11
ETAILS						1 4 1	4 414	1							
I. Works															
ams and appurienant wor	. La														
A. Preliminary Expen															
1. Survey of Reserve at 10 ft.—5 ft. int	oir bas	sins b	y air ]	photo	graphy	and	groun	d surv	еу вл	d p	lotting	of	conto	urs	
Ghugri dam .						50 aq.	miles								
Bilghara .	·					25 · 8 s		<b>e</b> s							
Bargi	·	·				7 sq.	_								
Dargi	•	•	•	•	-	72.8		iles	-						
					-				-						25.00
			sa. m	ile.	. •	•	•	· nd nl	ottina	ona	scale	• of <b>3</b> 2	'_l m	ile.	65,00
172.8 sq. miles at 2. Survey of dam sites	by air	r phot	ograp	hy an	d grou	na sw	rvey a	na pr	annura						10.00
2. Survey of dam sites 2,700 acres at Rs.	by air 4 per	r phot acre	ograp	•	d grou		·	·		•	•	•	•	•	10,80
<ol> <li>Survey of dam sites 2,700 acres at Rs.</li> <li>Geological investigation</li> </ol>	by air 4 per	r phot acre	ograp	•	d grou			·	•	•	•	•	•	•	10,80
<ol> <li>Survey of dam sites 2,700 acres at Rs.</li> <li>Geological investigat No. of bores</li> </ol>	by air 4 per	r phot acre	ograp	•	d grou	•	•		•	•	•	•	•		10,80
2. Survey of dam sites 2,700 acres at Rs. 3. Geological investigat No. of bores Bilghara	by air 4 per	r phot acre	ograp	•	d grou	40 No			•		•	•	•	•	10,80
<ol> <li>Survey of dam sites 2,700 acres at Rs.</li> <li>Geological investigat No. of bores</li> </ol>	by air 4 per	r phot acre	ograp	•	d grou	•	08.		·		•	•	•	•	10,80

148 bores each 50 r.ft. at F	Rs. 20	) per i	.ft.										•	Rs. 1,48,00
4. Soil analysis and burrow		_											L.S.	7,00
5. Model experiments .	•		•		•			•		•			L.S.	5,00
K. Buildings														2,35,80
Temporary Buildings .		.*											L.S.	30,00
II. Main Canals and Branch		10.00	000			0)								10.10.50
(a) Survey of commanded	area	18,00	,บบบ ณ	CLOB &	t (As	. 9) ре	r acre		•	•	•	•		10,12,50
(b) Miscellaneous survoys	•	٠.	. •	•	. •	•	•	•	•	•	•	•	L.S.	8,00
(c) Exploration for founds						•	•	•	•	•	•	•	•	60,00
(d) Soil surveys 18,00,000 a	acros	at Re	. 1 pe	r 100	acros	•	•	•	•	•	•	•	• —	18,00
														10,98,50
III. Malaria surveys .	•				•	•								1,00
IV. Electric load surveys														2,00
V. Property surveys 173 sq. r	miles	at Rs	s. 43 p	er sq	. mile		. •							7,50
VI. Communications .			. •											1,00,00
VII. Special Tools and Plant	•													-,00,00
2 Diamond drills .														1,20,00
Testing apparatus .	•	•	•	•	•	•	•	•	•	•	•	•	•	40,00
	•	•	•	•	•	•	•	•	•	•	•	•	•	
					63	THE PARTY								1,60,00
II. TOOLS AND PLANT	. 70	= 000		6			503							
Motor vehicles 7 vehicles at		7,000	•	100					٠	٠	•	•	•	49,00
Working expenses for 3 year	rs	•	•	- 129				٠	٠	•	•	•	•	52,50
Scientific Instruments .	•	•	•	- 8				•	٠	•	•	•	•	60,00
Ordinary Tools and Plant	•	•		. 1						•	•	•	•	5,00
Camp equipage	•	•	•		1.5		1		•	٠				15,000
Office furniture	•	•	•	٠	191			•	٠	•	•	•	•	20,000
				d						90/ -				2,01,500
				1						2%	onting	encie	·	4,030
III. Establishments														2,05,530
Cost of 1 Division for 3 year	rs at	Rs. 2	,88,69	6 per	year	19. 7	44	٠	•	•	•	•	٠	8,66,088
Estimate for the preliminary canal taking off from the d							r a da	m si	e on	the :	Tawa	Rive	r, and	a left bank
I. Works														
I. WORKS 1. Dams and appurtenant work			,											
I. Works 1. Dams and appurtenant work A. Preliminary expense					•		•	•	•					8 <b>7,</b> 12 <i>8</i>
I. Works 1. Dams and appurtenant work A. Preliminary expense K. Buildings							•	•						
<ul> <li>I. Works</li> <li>1. Dams and appurtenant work</li> <li>A. Preliminary expense</li> <li>K. Buildings</li> <li>2. Main canals and branches</li> </ul>														25,000
I. Works 1. Dams and appurtenant work A. Preliminary expense K. Buildings			,				· · ·	•						25,000 6,59,750
<ul> <li>I. Works</li> <li>1. Dams and appurtenant work</li> <li>A. Preliminary expense</li> <li>K. Buildings</li> <li>2. Main canals and branches</li> </ul>						·	•	•			•		•	25,000 6,59,750 1,000
<ul> <li>I. Works</li> <li>1. Dams and appurtenant work</li> <li>A. Preliminary expense</li> <li>K. Buildings</li> <li>2. Main canals and branches</li> <li>3. Malaria surveys</li> </ul>							•	•						25,000 6,59,750 1,000 500
I. Works 1. Dams and appurtenant work A. Preliminary expense K. Buildings 2. Main canals and branches 3. Malaria surveys 4. Electric load surveys 5. Property surveys														25,000 6,59,750 1,000 500 6,000
I. Works 1. Dams and appurtenant work A. Preliminary expense K. Buildings 2. Main canals and branches 3. Malaria surveys 4. Electric load surveys .								•						25,000 6,59,756 1,000 500 6,000 80,000
I. Works 1. Dams and appurtenant work A. Preliminary expense K. Buildings 2. Main canals and branches 3. Malaria surveys 4. Electric load surveys 5. Property surveys 6. Communications								•					:	25,000 6,59,750 1,000 500 6,000 80,000 1,35,000
I. Works 1. Dams and appurtenant work A. Preliminary expense K. Buildings 2. Main canals and branches 3. Malaria surveys 4. Electric load surveys 5. Property surveys 6. Communications										•	onting			25,000 6,59,750 1,000 500 6,000 80,000 1,35,000 9,94,378 19,888
<ol> <li>WORKS</li> <li>Doms and appurtenant work</li> <li>A. Preliminary expense</li> <li>K. Buildings</li> <li>Main canals and branches</li> <li>Malaria surveys</li> <li>Electric load surveys</li> <li>Property surveys</li> <li>Communications</li> </ol>										•	onting			25,000 6,59,750 1,000 500 6,000 80,000 1,35,000 9,94,375 19,888
I. Works 1. Dams and appurtenant work A. Preliminary expense K. Buildings 2. Main canals and branches 3. Malaria surveys 4. Electric load surveys 5. Property surveys 6. Communications 7. Special Tools and Plant  II. Tools and Plant										•	-			25,000 6,59,750 1,000 500 6,000 80,000 1,35,000 9,94,375 19,888
A. Preliminary expense K. Buildings 2. Main canals and branches 3. Malaria surveys 4. Electric load surveys 5. Property surveys 6. Communications 7. Special Tools and Plant										•	-	Work		87,124 25,000 6,59,750 1,000 500 6,000 80,000 1,35,000 9,94,375 19,888 10,14,263 95,370 4,33,044

#### **DETAILS**

#### I. Works

												_	
												t works	ams and appurisnan
												868	Preliminary Expen
tours													
ale of	8 BC	on •	tting •	plot	and	surve	round	nd g					
rilling 20 per	Rs.	g, c	borin 0 Rft	n by 1 of 5	r bas	eservo s. bor	n and i	of dan	tions o	oundat includ	s for fog, etc.	stigation tunnellin	3. Geological inve- making drifts, t Rft.
LS.	į	•	•		•	•	į		·	va	enrva	d hurrou	
	•	•	•		•		ion Po	Stat	-ara tro	•			•
• -	•	•	•	•	•	J210		N. VOI.	ways	*********	LUICLI	ones by a	b. Bloddi experim
													K. Buildings
L.S.	•	•	٠	•	•	•	•	•	•	•	•	-	Temporary buil ain Canals and Brai
•		Bore	per	As. 9	es at	000 ac	11,00	ımen	l align	Cana	rea for		
L.8.	•	•			•		•	•				зуя .	Miscellaneous surve
L.8.	•	•	в.	rvey	ary su	necess	ks and	wor	ainage	nb-aac	s of cro	undation	Explorations for fo
٠	•	•	•	•	•	Š.		crea	100 a	l per	at Ro.	000 acres	Soil surveys 11,00,0
									6				
L.S.	•	•			•		2		. 8		•		Malaria Surveys
L.8.					•	9		PH,	- 4		•	у .	Electric load surve
•	•		•				nile	aq.	/- per	Rs. 43	les at 1	39 sq. mi	Property surveys 1:
							Malla.	إيال	150				Communications
L.S.	•	•				de	ary rot	npor	ars ter	r 3 yea	ing for	mainteir	Constructing and
L.S.	•	٠	•	•	•	d <b>e</b>	ary rot	npor	ars ter	r 3 ye:	ing for		
L.S.	•	•			ch		533		E.	·		Plant	Constructing and
	and	onks	n of r n, etc	engtl	ve str	90 000, pressi	Rs. 60	es at	essori quipn	th acc	ete wit	Plant lls compl itus and	Constructing and Special Tools and I
testing	and	ooks	n of r n, etc	engtl lation	ve str	90 000, pressi	Rs. 60	es at	essori quipn	th acc	ete wit	Plant lls compl itus and	Constructing and Special Tools and I 1. 2 Diamond dri 2. Testing appare
testing		. <b></b> .	of r	lation	ve str	90 000, pressi	Rs. 60	es at	essori quipn	th acc	ete wit	Plant lls compl itus and	Constructing and Special Tools and I 1. 2 Diamond dri 2. Testing appare
testing	noies	inge	n, etc	lation 2%	ve str	90 000, pressi	Rs. 60	es at	essori quipn	th acc	ete wit	Plant lls compl itus and	Constructing and Special Tools and I 1. 2 Diamond dri 2. Testing appare
testing	noies	inge	n, etc	lation 2%	ve str	90 000, pressi	Rs. 60	es at	essori quipn	th acc	ete wit	Plant lls compl itus and	Constructing and Special Tools and I 1. 2 Diamond dri 2. Testing appare
testing	noies	inge	n, etc	lation 2%	ve str	000 es apressi and co	Rs. 60 for cor ontent	es at nent ure c	essori quipă moist	th acc tory e mum	ete wit labora 1, opti	Plant lls compl stus and r strongt	Constructing and Special Tools and I 1. 2 Diamond dri 2. Testing apparations for shear
testing	noies	inge	n, etc	lation 2%	ve str	000 es apressi and co	Rs. 60 for cor ontent	es at nent ure c	essori quipă moist	th acc tory e mum	ete wit labora n, opti	Plant lls compl tus and r strongt	Constructing and Special Tools and I 1. 2 Diamond dri 2. Testing apparations for shear
testing	noies	inge	n, etc	lation 2%	ve str	000 es apressi and co	Rs. 60 for cor ontent	es at nent ure c	essori quipă moist	th acc tory e mum	ete wit labora n, opti	Plant lis compl tus and r strongt survey pe for above	Constructing and Special Tools and I 1. 2 Diamond dri 2. Testing apparations for shear
testing	noies	inge	n, etc	lation 2%	ve str	000 es apressi and co	Rs. 60 for cor ontent	es at nent ure c	essori quipă moist	th acc tory e mum	ete wit labora n, opti	Plant lls compl tus and r strongt survey pa for above	Constructing and Special Tools and I 1. 2 Diamond dri 2. Testing apparations for shear soils for shear DLS AND PLANT Motor vehicles for a
testing	noies	inge	n, etc	lation 2%	ve str	000 es apressi and co	Rs. 60 for cor ontent	es at nent ure c	essori quipă moist	th acc tory e mum	ete wit labora n, opti	Plant lls compl tus and r strongt survey pa for above	Constructing and Special Tools and I 1. 2 Diamond dri 2. Testing appara soils for shea  OLS AND PLANT Motor vehicles for a Working expenses a Scientific Instrument
testing	noies	inge	n, etc	lation 2%	ve str	000 es apressi and co	Rs. 60 for cor ontent	es at nent ure c	essori quipă moist	th acc tory e mum	ete wit labora n, opti	Plant lls compl tus and r strongt survey pa for above	Constructing and Special Tools and I 1. 2 Diamond dri 2. Testing appara- soils for shea  OLS AND PLANT Motor vehicles for s Working expenses is Scientific Instrumes Ordinary Tools and
testing L.S.	noies	inge	n, etc	2% To	ve str	000 es apressi and co	Rs. 60 for cor ontent	es at nent ure c	essori quipă moist	th acc tory e mum	ete wit labora n, opti	Plant lls compl tus and r strongt survey pa for above	Constructing and Special Tools and I 1. 2 Diamond dri 2. Testing appara- soils for shea  OLS AND PLANT Motor vehicles for s Working expenses if Scientific Instrume Ordinary Tools and Camp equipage
	L.S. L.S. L.S. L.S. L.S.	mile a scale of ore drilling Rs. 20 per L.S L.S	sq. mile on a scale of sg, core drilling . at Rs. 20 per	ting on a scale of ting on a scale of borin'g, core drilling 0 Rft. at Rs. 20 per L.S. L.S.  L.S.  L.S.  L.S.  L.S.  L.S.  L.S.  L.S.	Rs. 375 per sq. mile  I plotting on a scale of in by borin'g, core drilling h of 50 Rft. at Rs. 20 per  L.S.  L.S.  L.S.  L.S.  L.S.  L.S.  L.S.  L.S.	es at Rs. 375 per sq. mile  y and plotting on a scale of ir basin by borin*g, core drilling as each of 50 Rft. at Rs. 20 per  L.S.  L.S.  L.S.  L.S.  L.S.  L.S.  L.S.	sq. miles at Rs. 376 per sq. mile survey and plotting on a scale of reservoir basin by borin*g, core drilling os. bores each of 50 Rft. at Rs. 20 per	le 139 sq. miles at Rs. 376 per sq. mile ground survey and plotting on a scale of m and reservoir basin by boring, core drilling g 30 Nos. bores each of 50 Rft. at Rs. 20 per	1 mile 139 sq. miles at Rs. 376 per sq. mile and ground survey and plotting on a scale of of dam and reservoir basin by borin g, core drilling beting 30 Nos. bores each of 50 Rft. at Rs. 20 per	f 4"=1 mile 139 sq. miles at Rs. 375 per sq. mile  thy and ground survey and plotting on a scale of the streeth street	calo of 4"=1 mile 139 sq. miles at Rs. 375 per sq. mile tography and ground survey and plotting on a scale of por acre.  bundations of dam and reservoir basin by borin"g, core drilling including testing 30 Nos. bores each of 50 Rft. at Rs. 20 per  ys  L.S.  Waterways Station, Poona  L.S.  Canal alignment 11,00,000 acres at As. 9 per acre  L.S.  per drainage works and necessary surveys  L.S.  L.S.  L.S.  L.S.  L.S.  L.S.	on a scale of 4"=1 mile 139 sq. miles at As. 375 per sq. mile  ir photography and ground survey and plotting on a scale of Rs. 4 por acre.  s for foundations of dam and reservoir basin by boring, core drilling g, etc. including testing 30 Nos. bores each of 50 Rft. at Rs. 20 per surveys  L.S.  indian Waterways Station, Poons  L.S.  rea for Canal alignment 11,00,000 acres at As. 9 per acre  L.S.  at Ro. 1 per 100 acres  L.S.  L.S.  L.S.  L.S.  L.S.	rvoir basin by air photography and ground survey and plotting contours intervals on a scale of 4°=1 mile 139 sq. miles at Rs. 375 per sq. mile  site by air photography and ground survey and plotting on a scale of acros at Rs. 4 por acre.  stigations for foundations of dam and reservoir basin by boring, core drilling tunnelling, etc. including testing 30 Nos. boros each of 50 Rft. at Rs. 20 per add burrow surveys

3. Astimate for the preliminary surveys and investigations for a dam site on the Narbada River near Punasa, for purposes of flood control and generating hydro-electric power.

ABSTRACT									•				
I. Works													
1. Bams and Appurtenant Works													Rs.
A. Preliminary Expenses						• •	•		-		•	•	3,04,500
K. Buildings			•				,	•	•	•	•	•	30,000
2. Malaria surveys							•	•	•	•	•	•	3,000
3. Electric lead surveys		•		•				•		•	•	•	7,500
4. Property surveys				•	•				٠.	•	•	•	21,500
5. Communications			•		•				•		•	•	1,00,000
6. Special Tools and Plant .						•	•	•	•	•	•	•	1,45,000
								29	% con	tingen	cies		6,11,500 12,230
								า	<sup>የ</sup> ሰጥልፕ»	-Wor	ka		6,23,730
NY 100 and a sum The same	•							-	UIAN	1102			24,990
II. Tools and Plant	•	•	•	•	•	•	•	•	•	•	•	•	86,609
III. Establishment	٠	•	•	•	•	•	•	•	•	Тот	AL	•	7,35,329
DETAILS													
I. Works				,,,,,,,,,,,	638%								,
1. Dams and appurtenant works			1/2			05				•			•
A. Preliminary Expenses			(3)			派》							
1. Survey of Beservoir be	sin b	y air	photo	graph	y and	grou	nd su	rvey	and j	olottin	g cor	tours	1,87,500
at 10 ft.—5 ft. interve 2. Survey of dam site by													
32"=1 mile, 2,000 acr 3. Geological Investigatio	es at	Rs. 4	por ac	cro .	10 14		•	•	•	•	•	•	8,000
drilling, making drift	s, tur	mellin	g, ote	. inclu	ding t	testing	100	Nos.	bores	each	50′ d	leep=	1,00,000
5,000 Rft. at Rs. 20 r 4. Soil analysis and burro			or oan	thon d	okou i	nelud	ing te	stinø				L.S.	2,000
5. Model Experiments by												L.S.	7,000
b. Brotter maporiments by	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	,,,,,		बद्धार्थ	व जड	a							3,04,500
K. Buildings													
1. Temporary Buildings			•	•	•	•	•		•	•	٠	L.S.	30,000
2. Malaria Surveys .	•	•			•	•	•	•	•	•	•	L.S.	3,000
3. Electric load surveys			•	•	•	•	•	•	•	•	•	L.S.	7,500
<ol><li>Property surveys 500 s</li></ol>	q. mil	les at	Rs. 43	per so	q. mi	les .	•	•	•	•	•	•	21,500
5. Communications													
Constructing temporary	road	s and	thoir	mainte	nance	e for 3	years			•	•	L.S.	1,00,000
6. Special Tools and Plan													
1. 2 diamond drills com	ploto	with	access	ories a	t Rs.	60,000	0 oach	ı .	•	•			1,20,000
2. Testing apparatus fo	r Lak	orato	ry and	l work	shop	oquip	mont	for c	ompre	esive	stren	gth of	
rocks and testing soil	s for :	shear	strong	th, op	timun	n mois	turo	conu	ont a		nsone	L.S.	25,000
												,	1,45,000
													6,11,500
•									2% c	onting	encio	88	12,230
									Тот	alW	/orks		6,23,730

II. Tools and Plant											٠	-	Rs.
Motor vehicle for survey party 1 No. a	at Rs.	7,000	•		•				•		÷	ņ	7,000
Working expenses for 3 years .		٠	•	•	•	•	•	•	•	•	•		7,50
Scientific instruments	•	•	•	•	•	•	•	•	•	•	•		6,06
Ordinary Tools and Plant	•	-	•	•	•	•	•	•	•	•	•		50
Camp equipage	•	•	•		•	•	•	•	•	•	•		1,500
Office furniture	•	•	•	•	•	•	•	•	•	•	•		2,000
•								2% 00	nting	encies		•	24,500 490
								,,	•			<del></del>	24,990
III. Establishment												<del></del> -	<del></del>
Cost of 1 Division for 3 years—8,66,08	88. 1	10% ch	argea	ble to	Pun	ава		•	•	•	٠		86,609
BSTRACT  I. Works  1. Dams and Appurtenant works  A. Preliminary Expenses  K. Buildings  2. Main Canals and Branches													28,00 15,00 5,94,500
3. Communications	•					•	•	•	•	•	•		20,00
		69			9		2	% con	tinger	ncies			6,57,50 _13,15
		بأبير			ь.			Tota	L-V	Vorks			6,70,65
II. Tools and Plant		A STATE OF THE PARTY OF THE PAR		. 7									85,17
III. ESTABLISHMENT		The second	F-15					•					3,46,43
		7.17	्राधेव	HJ.					To	TAL			11,02,25
ETAILS				. ,									
I. Works													
1. Dams and appurtenant works													
A. Preliminary Expenses													
1. Survey of weir site by air pho			d gro	und s	urvej	sand	l plot	ting o	d a sci	ale of	32″≖	=	4.54
1 mile, 500 acres at Rs. 4 pe 2. Geological Investigations for			.e					4-2112-			1 !		2,00
testing. 25 Nos. bores, each	a of d	opth 5	l'=1,	250 R	oy bu	Rs.	20 po	r Rft.	g, 610	. men	ıuın		25,00
3. Modei Experiments by Indian	Wat	erways	Stat	ion P	oona					<b>&gt;</b>	L	8.	1,00
													28,00
K. Buildings													20,00
m		•			•	•	•				L.S		15,00
Temporary Buildings													•
2. Main Canals and Branches						0.000	0.070	n + A	. 0				5,62,50
2. Main Canals and Branches	or alic	gnment	8 of a	anals	. 10.0	U.UU	TO CLEAN	8 au A:	3. D III	or war	,		
Main Canals and Branches     Survey of commanded areas for	or alig	gnment	s of c	anals	, 10,0	U,UUU		8 a, t A,	s. a be	er agre		١.	
2. Main Canals and Branches						•			•		L.S L.S		7,00
Main Canals and Branches     Survey of commanded areas for 2. Miscellaneous surveys	of cro	ss-drai	nage	works		•			•	er agre	L.S		

8. Communications Constructing temporary roads and	main	tainin	g the	m for 3	year	в.	•	•	•	L.S.	20,000
2% contingencies		•									6,57,500 13,150
5 / V - 22				Total	Wor	ks .					6,70,650
TOOLS AND PLANT											
Motor vehicles for survey parties 3	Nos.	. at Rs	. 7,00	00 each		•	•	•	•	•	21,000
Working expenses for 3 years .				•	•	•	•	•	•		22,500
Scientific Instruments		•			•	•	•	•	•	•	24,000
Ordinary Tools and Plant .		•		•	•	•	•	٠.	•	٠,	2,000
Camp equipage		•									6,000
Office furniture	•	•	•	•	•	•	•	٠	•	•	8,000
2% contingencies .		•									83,500 1,670
											85,170
Cost of I Division for 3 years 8,66	1000	400/	ahar	reahle :	to Dr	aah 1	<b>Droi</b> ce	.+			3,46,435
									•	•	
5. Estimate for the general investi					in th	e wh	ole ba	sin	in co	mnection	r with Projects
multi-purpose development of the	uio	uuu L	ruo eli	ABSI	RAC	? <b>T</b>					
WORKS				*******							Rs.
<ol> <li>Discharge and Silt Observation</li> </ol>	. B	•	•	teles.		•	•	•	•	•	2,00,000
2. Meteorological Observations	•	6.20		15/15			•		•	•	25,800
3. Mineral Surveys		(J. N.			F.	•	. '	•	•	•	10,000
4. Surveys for Pisciculture .		70							•	•	2,000
5. Surveys for Navigation .		-86		A	ÿ.	•				•	1,00,000
6. Economic Surveys		. 9			y .				•		25,000
7. Surveys for soil erosion .	٠.	.				•				•	7,500
		757			53.					<del></del>	3,70,300
2% contingencies .	•					٠	•	•	•	•	7,406
		16		Total		٠		•	•	•	3,77,706
			DE	TAIL	3						
works		1	144	जिं गी.	1						
1. Discharge and silt observations				•.							
One boatman and four khalasis at floats, gauges, silt samplers, and l					d cost	ofr	opes,	disch	arge	rods,	
10 sites (8 on Narbada and 2 at					2 0 5 1	000 5	or site	nan	TOO D	for 4	
years	iawa.	and L	•			• •	or site	. ber	y bai	101.4	2,00,000
?. Meteorological Observations (Rainga	uge)										
Raingauges, Temperature, humidi	ity, a	nd win	d vel	ocity of	Berve	tions	١			_	
<ul> <li>(i) Equipment and installation of 1self-recording type), humidity a</li> </ul>	5 new	raing	auge	s (some	of th	ese to	be of	the	integ	rated	
rate of Rs. 1,000	mu w	mid ve	ioci i	y appar		น 5 ธ	ration	8 BL 1	an av	erage	15,000
(ii) Recurring expenditure on part-	time	observ	ers.	15 obs	erver	at R	s. 15	p.m.	for 4	years	10,800
										_	2,25,800
3. Mineral Surveys										L.S.	10,000
4. Surveys for Pisciculture										L.S.	2,000
5. Surveys for Navigation										L.S.	1,00,000
6. Economic Surveys										L.S.	25,000
7. Surveys for soil erosion	•	•	•			•	•			L.S.	7,500
<b>₩</b> 7										-	2 70 200
											3,70,300
2% contingencies	•	•	•	. 🕏	•			•			7,406
	•	•	•	, es	al.W		•	•	•	• –	3,77,706

## Details of the establishment of the two Divisions provided for in the preceding five estimates.

1. Pay of Officers	Details of establishment of the two Bivisions	Bopendare per year
2 Executive Engineers @ Rs. 875 p.r	n •	21,000
4 Asstt. Executivo Engineers @ Rs.		28,800
4 Asstt. Engineers @ Rs. 560 p.m.	•	26,880
1 Geologist @ Rs. 875 p.m		10,500
2 Asstt. Geologists @ Rs. 500 p.m.		12,000
1 Officer to conduct economic survey	s @ Rs.	
550 p.m	• •	6;600
l Drill Foreman @ Rs. 100 p.m	1 No. at Rs. 1,000 p.m	12,000
2. Pay of Establishment		117,780
3 Meteorological Asstts. @ 240 p.m.		8 <b>,64</b> 0
2 Accountants @ Rs. 200 p.m.	•	4,800
2 Head Clerks @ Rs. 180 p.m.	•	4,320
6 Senior Clerks @ Rs. 150 p.m		10,800
2 Storekeepers @ Rs. 150 p.m	• •	<b>3,600</b>
14 Junior Clerks @ Rs. 93 p.m		15,624
2 Senior Deraftsmen @ Rs. 200 pm.		4,800
2 Junior Draftsmen @ Rs. 143 p.m.	•	3,432
4 Tracers @ Rs. 104 p.m	•	4,992
2 Sub-Asstts, Surgeons @ Rs. 170 p	.m	4,080
2 Compounders @ Rs. 50 p.m		1,200
32 Overseers @ Rs. 240 p.m.		92,160
6 Research Asstts. @ Rs. 240 p.m.		17,280
2 Laboratory Asstts. @ Rs. 230 p.m		5,520
2 Silt Analysts @ Rs. 200 p.m	. 9	4,800
2 Asstt. Silt Analysts @ Rs. 93 p.n	1	2,232
10 Gauge Readers @ Rs. 70 p.m	1.42.3 1.33.1	8,400
10 Senior Observers @ Rs. 90 p.m.		10,800
2 Daffadars @ Rs. 33 p.m	50 380 30A	792
10 Barkandazes @ Rs. 33 p.m.		3,960
14 Peons @ Rs. 33 p.m	•	5,844
6 Laboratery khalasis @ Rs. 33 p.m	서로시의 취실적	2,376
10 Chowkidars @ Rs. 33 p.m.	•	3,960
		2,24,112
3. Dearness Allowance for officers	• •	16,020
4. Dearness Allowance for establishment	•	66,480
5. T. A. for officers .	• •	40,000
6. T. A. for establishment		60,000
7. Cost of Project circle office debited to	Narbada	33,000
		20,000

Cost of establishment of I Division per year

 $\frac{5,77,392}{2} = 2,88,696$ 

Cost of 1 Division for 3 years Rs. 8,66,088

G. N. PANDIT,

Project Officer, (Narbada and Tapti).

#### APPENDIX V

#### TAPTI VALLEY PROJECTS

As in the case of the Narbada, no work for utilising the waters of the Tapti river has so far been executed. This river drains a total area of about 30,000 square miles and approximately 45 million acre feet of water precipitate in the basin during the monsoon months. The entire quantity runs to waste to the sea. The Surat plain often gets flooded causing a lot of damage to life and property. During the last 60 years as many as 15 floods have been reported within this area. The maximum discharge has been calculated to have reached the figure of 900,000 cusees. Towards the end of the last century a proposal for irrigating lands in the Surat plain was investigated but the scheme did not materialise.

Government of Bombay approached CWINC about a year and a half ago with a request to investigate and formulate schemes which would mitigate the evil of flood and enable the water resources of the basin being utilised for such other beneficial purposes as irrigation, extension of navigation and generation of hydel power. Studies of topographical and hydrological data of the basin were accordingly taken up by the CWINC early in 1947. These studies have revealed that quite a number of suitable sites for development exists in the basin whereby construction of dams of low to medium heights reservoirs can be greated for storage of water during monsoons, regulated discharges from which can be utilized for the multipurposes of irrigation and power generation. By allowing a reserve for flood absorption in the lowermost reservoir, floods in the Surat plain can be completely controlled.

For the present it has been decided to investigate only six projects of which four are on the main river and two on the tributaries. Another project on an important tributary Girna is being investigated by the Government of Bombay. Total storage at these sites will amount to about 4.5 million acre feet, slightly less than in the case of the Damodar Valley Projects. A gross area of 12,85,000 will be commanded for irrigation and 63,010 kW. of continuous power generated. Such other benefits as fish culture in the reservoirs, recreational amenities and assurance of adequate domestic water supplies will also accrue to the entire basin with the development of these projects. A list of the projects as well as their details is appended to this note.

The estimate amounting to Rs. 42,25,034 has been prepared to cover the cost of necessary surveys and investigations in order to prepare the projects in detail for execution. It is proposed to set up one division with four sub-divisions and requisite number of subordinate and ministerial staff to do the work. Details of the work to be done are shown in the estimate. Topographical surveys of the dam sites, reservoir areas, areas to be commanded for irrigation will be done through the agency of the Survey of India Department. Geological surveys of the dam sites and mineral surveys of the basin will be undertaken in collaboration of the Geological Survey of India. Hydrological surveys will similarly be done in close co-operation with the Indian Meteorological Department. Provisions have also been made for soil surveys of the area to be irrigated and such other items as electrical load surveys, malaria control surveys, fish culture survey and economic and property survey. Necessary staff for geological and other surveys has been provided. It is anticipated that a period of two years will be required to complete all these surveys and investigations. Accordingly staff has been provided for that period. Necessary tools and plant such as survey instruments, core drills, camp requisites have also been provided for.

A statement showing the rough data for the dam sites and the anticipated benefits from the projects is given on page 44. The following maps and charts are enclosed.

- (1) An index map of the Tapti basin showing the proposed dam sites and projects.
- (2) A profile of the Tapti river and its main tributaries.

G. N. PANDIT,

Project Officer (Narbada and Tapti).

Tapti Basin—Rough Data for the Dam Sites

44

1. Name of the river	Tapti	Tapti	Tapti	Tapti	Waghur	Panjhra
2. Name of dam site	Atwadhana	Nawtha	Hatnur	Ukai	Bhagpur	Akalpada
3. Length along river (miles)	91	259	315	487	44	36
	77° 20′ 0″ E 21° 49′ 15″ N	76° 27′ 0″ E 21° 26′ 0″ N	75° 57′ 0″ E 21° 3′ 30″ N	73° 35′ 30″ E 21° 15′ 30″ N 2	75° 42′ 0″ F 0° 56′ 0″ N	20° 57′ 0″ N
<ol> <li>Catchment area above dam (sq. miles).</li> </ol>	1,049	3,100	11,750	23,365	789	510
<ol> <li>Average rainfall in catchment (inches).</li> </ol>	43	41.88	34 · 42	30.37	30	30
7. Probable mean annual run-off. (m. a. ft.)	0.92	1.4	2.5	3·43*	0.17	0.108
8. R. L. of river bed	1,190	800	625	175	730	1,170
9. Proposed F. T. L	1,340	900	690	400	Not work	ked out.
10. Maximum height of dam up to F. T. L. (ft.).	150	100	65	225	Not work	ted out.
11. Length of dam at F. T. L. (ft.) .	2,700	2,640	20,000	16,000	Not wor	ked out.
12. Gross capacity of reservoir at F. T. L. (m. a. ft.).	0.82	0.63	••	6.19	Not work	red out.
13. Dead storage (n. a. ft.)	0.11	0.20		1.71	Not work	red out.
14. Maximum area of water spread (acres).	11,900	19,400	• •	1,76,000	Not work	ked out.
15. Losses due to evaporation (5.5 ft. per year) (m. a. ft.)	0.042	0.075		0.49	Not work	ed outs
16. Reserve for flood control (m. a. ft.)			2	1.05	Not work	ked out.
17. Net Storage available (m. a. ft.)	0.67	0.28	£3	2.94	Not work	ked out.
18. Continuous regulated discharge (cuseos).	890	1,285	1,28	5 4,000	Not wor	ked out.
19. R. L. of top of dead storage	1,252	875		360	Not work	ked out.
20. R. L. of Tail Race	1,160	810		195	Not work	ced out.
21. Average head available for power (ft.).	141	77:5		181	Not work	red out.
22. Continuous power available (kW.)	8,360	6,650		48,000	Not work	ked out.
23. Gross area commanded (acres)	.(		5,00,000	7,00,000	50,000	35,000
	*Excluding r	un-off interce	pted above.			
I. Total live storage impounded		सन्दर्भ भाग भाग	1		4·497 m. a	.ft.
II. Total continuous power generate	ed .				63,010 kW	
III. Total gross area commanded for			,		12,85,000 a	

## Tapti Projects Estimates

Over all Estimate for Preliminary Surveys and Investigations in connection with Projects for the multi-purpose development of the Tapti Basin

#### Abstract

I. WORKS										
1. Dams and Appurtenant works										_
A. Preliminary expenses										Rs.
K. Buildings	•	•	•	•	•	•	•	•	•	5,80,000 60,000
2. Main canals and Branches .	•	.*	•	•	•	•	•	•	•	14,78,800
3. Discharge and Slit Observations	•	•	•		•	•	•	•	•	1,40,000
4. Meteorological Observations .	•	•	•	·	•	•		•		17,200
5. Mineral survey	•								•	5,000
6. Surveys for Pisciculture										1,000
7. Malaria surveys	•	•	•			•			•	2,500
8. Electric Load surveys	•	•	•					•		5,000
9. Surveys for Navigation	•	•	•	•	•	•	•	•	•	[ 40,000
10. Economic and property survey	•	•	•	•	•	•	•	•	•	20,000
11. Survey for soil erosion	•	1500	84		•	•	•		•	5,000
12. Communications	AVE			23	•	٠	•	•	•	1,50,000
13. Special Tools and Plant	T.			2		•	•	•	•	2,30,000
	7.2									27,34,500
2 per cent contingencies .					•	•	.*	•	•	54,690
	V		7	otal	Works	•	•	•	•	27,89,190
II. TOOLS AND PLANT	1			54						
Tools and plant for the Division .	1			31					•	2,19,000
2 per cent contingencies	17	77.75		٧.		•		•	•	4,380
	7.1	यमह	53	Cotal	Tools e	and P	lant	•	•	2,23,380
III. ESTABLISHMENT									•	<del></del>
Establishment for 4 years including es	tablish	ment c	ontir	genei	es .	•	•	•	•	12,12,464
					Q	rand	Total		•	42,25,034
									,	
1. WORKS		1	Detail							
Dams and Appurtenant Works										
A. preliminary Expenses										
<ol> <li>Survey of the reservoir basins by contours at 10ft.—5 ft. intervals on</li> </ol>	air pho a scale	otogra of 4"	phy i	and g	round	surve	y and		_	
(a) Tukai/Tokarwa dam	•		٠					sq. m	iles 275	
(b) Nawtha Dam		•	•	•	•	•	•		84	
(c) Atawadhna dam		•	•				•		18-6	
(d) Waghar and Panjhra dam .	•	•	•	•	٠.		•		15	
					Tot	al j			342.6	
								بالمجمعة		

2. Sur	$42\cdot 6$ Sq. Miles @	Rs. 3	75 per 8	Sq. M	file	. ^	•			٠	•		Rs. 1,28,000
	vey of the dam	sites a	and we	ir sit	tos by	, air j	photo	graph	y an	d gro	und	•	
surv	eys and plotting	on.a s	cale of	32"=	≂l mi	le.							
				1 (.								acres	
	Ukai/Tokarwa da		∍ .	•	•	•	•	• •	•	•	•	3,000	
	Kakarpar weir si	te	•	•	•	• *	•	•	•	•	•	600	
	Hatnur weir site	•	•	•	•	•	•	•	٠	•	•	<b>6</b> 00	
	Nawtha dam site		•	•.	•	•	•	•	•	•	•	600	
	Atawadhna dam		•	•	•	•	•	•	٠	•	. :	600	
	Paujhra dam site		•	•	•	•	•	•	•	•	•	. 800	
(g)	Waghur dam site		•		•	• '	•	•	•	•	•.	1,800	
0	,000 acrès at Rs.	4 nor	nara			.*						8,000	32,000
	,000 aeres at 10s. ological investiga	•		• ndati	ions o	f tha	đom.	eitaa	• nd	woii e	iitaa		32,000
and	of the reserved nelling etc., inclu	r basi	ins by										
(a)	Kakarpar Weir											Nos. 22	
• •	Ukai/Tokarwa d		•	•	•	•		•	•	•			
, ,	Hatnur woir .	CP111		•		. •	•	•	. •	•		160	
• /	Nawtha dam			•	•	•		•	. •	•	7	$\begin{array}{c} 20 \\ 27 \end{array}$	1
	Atawadhna dam	•	•	,	•	•		•	•	. •	•		
		•	. •	•	•		•	•	•	•		27	
	Waghur dam Panjhra dam	•	•	•	•	-	energy.	•	•	•	*	40	
:. (g)	ranjura dam	•	•	•	· Jenn	100		-	•	` •	•	100	
					E	HE		43				400	
	nos. each of 50,:				7 4 1 -	a CA STANDARD	E ALBECT TURN	A	•	•	٠		4,00,000
	il analysis and bu		-		67.75m	7 100 100	And I do	19.		iting	. •	L.S.	10,000
5. Mc	odel Experiments	by th	e India	n W	atorwa	ays St	ation,	, Poor	10.	•	•	L.S.	10,000
					Ĭ			1					5,80,000
. Building	gs					MA	114						
$_{ m Tem_{ m F}}$	porary buildings		•	•	100	153	124	32	•	•	•	L.S.	60,000
Main cana	als and branches				. 40								* *
(a) S	urvoys of the con	mand	led area	s-for	align	ment	of ear	nals.				i	
							at at	5				acres	
	nals ex. Kakarpa	r .	•	•	· (c)	E	व भाग		•	•	•	7,00,000	
	nals ex. Hatnur	,		•	•	•	•	•	•	•	•	5,90,000	
Car	nals ex. Waghur	and Pa	anjhra	•									
						•	•	•	•	•	•	50,000	
			•			·		•	•	•	. •	12,50,000	
· . ;	10 KO 00'0	D (				•		•	•	•			•
	f 2,50,000 acres at Liscollangous suvi		/2 per s	iere		•	•		•	•	. •	12,50,000	14,06,300
(b) M	liscollaneous suvi	геув			•	·	o wani	ro and	· ·	, , , , , , , , , , , , , , , , , , ,	•		14,06, <b>3</b> 00 10,000
(b) M		геув			ess-dr	ainag	e worl	ks and	i noc	eossary	. •	12,50,000	10,000
(b) M (c) E	liscollaneous suvi Exploration for the survoys	reys o foun	dation	of cr			•	ks and	i noc	eossary		12,50,000	10,000 50,000
(b) M (c) E	liscollaneous suvi	reys o foun	dation	of cr			•	ks and	i noc	eossary	•	12,50,000	10,000 50,000 12,500
(b) M (c) E	liscollaneous suvi Exploration for the survoys	reys o foun	dation	of cr			•	ks and	i i i i	eossary	•	12,50,000	10,000 50,000
(b) M (c) E (d) S  Discharge One boat rods, fle 7 sites (5	Iscollaneous suvi exploration for the survoys	reys o foun ,000 ac tions ( khalasi sample u Wag	dation cres at i period dis at ea ers and ghur and	of ere	l per l ers) lischar eratory njhra)	100 ac. rge sit y equi ) at Rs	res te, ces pinent s. 5,00	• st of t. 00 per	rope site	s discl	narg <b>o</b>	12,50,000 L.S.	10,000 50,000 12,500
(b) M (c) E (d) S  Discharge One boat rods, fle 7 sites (5  Meteorologobserva	Exploration for the surveys	reys e foun ,000 ac tions ( thalasi sample u Wag s, rair	period is at eacers and glur and	of ero Ro. I 4 year ach d Iabor d Par es, ten	rs) lischar ratory njhra) mpera	100 ac. rge sit y oqui ) at Rs	res te, cos pmont s. 5,00 humid	st of t. 00 per	rope site	s discl per ye	• narg <b>o</b> ear•	12,50,000 L.S.	10,000 50,000 12,500 14,78,80 <del>0</del>
(b) M (c) E (d) S  Discharge One boat rods, fid observa  Equipment tegrate station	Exploration for the surveys 12,50 and Slit Observa man and four loats, gauges, silt on Tapti and 2 o gical Observations and installations of self recording is, at an average is	reys o foun ,000 ac tions ( chalasis sample a Wag s, rair on of type), rate of	period is at eacers and thur one gauge ten new, Humif Rs. 1,6	of ere . Re. 1 4 year ach d labor tabor d Par es, ten w rain idity 000	rs) lischar ratory njhra) mperan and	rge sity oqui y oqui ) at Reture, I	te, cos pmont s. 5,00 humid some e veloc	st of t. 00 per lity ar	rope site ad u	per ye	narge	12,50,000 L.S.	10,000 50,000 12,500 14,78,80 <del>0</del>
(b) M (c) E (d) S  Discharge One boat rods, fig 7 sites (5) Meteorolo observa Equipment tegrate station Recurring	Exploration for the survoys	reys o foun ,000 ac tions ( chalasis sample a Wag s, rair on of typo), rate of part-t	period is at eacers and ghur one gauge, ten nev, Humi f Rs. 1,6	of ere . Re. 1 4 year ach d labor tabor d Par es, ten w rain idity 000	rs) lischar ratory njhra) mperan and	rge sity oqui y oqui ) at Reture, I	te, cos pmont s. 5,00 humid some e veloc	st of t. 00 per lity ar	rope site ad u	per ye	narge	12,50,000 L.S.	10,000 50,000 12,500 14,78,800
(b) M (c) E (d) S  Discharge One boat rods, fig 7 sites (5) Meteorolo observa Equipment tegrate station Recurring	Exploration for the surveys	reys o foun ,000 ac tions ( chalasis sample a Wag s, rair on of typo), rate of part-t	period is at eacers and ghur one gauge, ten nev, Humi f Rs. 1,6	of ere . Re. 1 4 year ach d labor tabor d Par es, ten w rain idity 000	rs) lischar ratory njhra) mperan and	rge sity oqui y oqui ) at Reture, I	te, cos pmont s. 5,00 humid some e veloc	st of t. 00 per lity ar	rope site ad u	per ye	narge	12,50,000 L.S.	10,000 50,000 12,500 14,78,800 1,40,000

V. Mineral Surveys	•		•			•	L.S.			5,000
VI. Surveys for Pisciculture	•			•	•	•	L.S.			1,000
VII. Malaria survey	•	٠	•	•	•	•	L.S.			2,500
VIII. Electrical Load surveys	• .	•	٠		•		L.S.			5,000
IX. Surveys for navigation	• •	•		•	•		L.S.			40,000
X. Economic and property surveys	٠	•		•	•		L.S.			20,000
XI. Survoys for soil erosion	•	•		•	•	•	L.S.			5,000
XII. Communications										
Constructing 50 miles of temporary roads 3,000 per mile	s and	l mai	ntena	noe f	or 4	yoars	at R	8.		1,50,000
XIII. Special Tools and Plant										
3 Diamond drills complete with accessories a	t Rs.	60,00	00 eac	h.	•	•	•			1,80,000
Tisting apparatus and lab. and workshop of rocks and testing soils for shear strensolidation, etc.						ntent		u.		50,000
										2,30,000
										27,37,500
2 per ce	nt oc	nting	encio	e .						54,690
	Ch.			<b>Y</b> .	Total	Worl	. B			27,89,190
€		12								
II. TOOLS AND PLANT										
										Re.
1. Motor vehicles for survey parties 7 veh	nicles	at R	s. 7,00	00 вас	ch .	•				49,000
Working expenses for 4 years .								•		70,000
2. Scientific Instruments				h.		٠,		•		60,000
3. Ordinary Tools and Plant	J.C.			ø.			•	•		5,000
4. Camp equipage	•	TITE.	3.13					•	•	15,000
5. Office furniture	•	4 444	- -		•			•	•	20,000
									•	2,19,000
2 per cent continge	noies	•	•	•	•	•	•	•	•	4,380
Total Tools and Pla	nt	•	•	•	•	•	•	•	•	2,23,380
III. ESTABLISHMENT										
										Expenditure per year
1. Pay of officers										10 500
Executive Engineer 1 No. at Rs. 875 p.m.		•	•	•	•	•	•	•	•	10,500
Asstt. Executive Engineers 2 Nos. at Rs.	000	p.m.	•	•	•	•	•	•	•	14,400
Asstt. Engineers 2 Nos. at Rs. 560 p.m.	•	•	•	•	•	•	•	•	•	13,440
Geologist 1 No. at Rs. 875 p.m.	•	•	•	•	•	•	•	•	•	10,500
Asstt. Geologists 2 Nos. at Rs. 500 p.m.	•	•	•	•	•	•	٠	•	•	12,000
Drill Foreman 1 No. at Rs. 1,000 p.m.	•	•	•	•	•	•	•	•	٠.	12,000
										72,840

2. Pay of establishment					
1 Moteorological Assistant at Rs. 240 p.m.					2,880
1 Accountant at Rs. 200 p.m			•		2,400
l Head Clork at Rs. 180 p.m					2,160
3 Senior Clerks at Rs. 150 p.m.					5,400
1 Storekeeper at Rs. 150 p.m				•	1,800
I Senior Draftsman at Rs. 200 p.m.			,		2,400
7 Junior Clerks at Rs. 93 p.m.		•		•	7,812
l Junior Draftsman at Rs. 143 p.m.		•		•	1,716
2 Tracers at Rs. 104 p.m.			•		2,496
1 Sub-Asstt. Surgeon at Rs. 170 p.m.					2,040
1 Compounder at Rs. 50 p.m				6	600
16 Overseers at Rs. 240 p.m.		•	•	•	46,080
3 Research Assistants at Rs. 240 p.m.				•	8,640
l Laboratory Assistant at Rs. 230 p.m					2,760
1 Silt Analyst at Rs. 200 p.m.					2,400
1 Asstt. Silt Analyst at Rs. 93 p.m.	•	•		•	1,116
5 Gauge Readers at Rs. 70 p.m.		•	•	•	4,200
5 Senior Observers at Rs. 90 p.m				•	5,400
1 Dafadar at Rs. 33 p.m.		•		•	396
5 Barkandazee at Rs. 33 p.m	•	•		•	1,980
7 Peons at Rs. 33 p.m.	•		•	•	2,772
3 Laboratory khalasis at Rs. 33 p.m.		•	•	•	1,188
5 Chowkidars at Rs. 33 p.m	•		•	•	1,980
					1,10,616
3. Dearness allowance for officers				•	9,720
4. Dearness allowance of establishment				•	<b>32,94</b> 0
5. Travelling allowance for officers				•	20,000
6. Travelling allowance for establishment	•			•	13,000
7. Cost of Project Circle office debited to Tapti			•	•	17,000
8. Establishment contingencies	•		•	•	10,000
Establishment per year		•		•	3,03,116
Total establishment for four year	· 6'		•	•	12,12,464

G. N. PANDIT,

Project Officer, (Narbada and Tapti).

II. ESTIMATE FOR PRELIMINARY SURVEYS AND INVESTIGATIONS IN CONNECTION WITH PROJECTS
FOR MULTI-PURPOSE DEVELOPMENT IN THE BASIN OF TAPTI RIVER FOR THE YEAR 194748 SUBMITTED TO GOVERNMENT FOR SANCTION

ABSTRACT		
I. WORKS II. TOOLS AND PLANT III. ESTABLISHMENT	• • •	Rs. 61,960 1,56,684 41,895
	l Total	2,66,540
DETAILS		
WORKS  1. Dams and appurtenant works  (i) Survey to be carried out by the Survey of India Department . L.S.  (ii) Survey to be carried out by or under the directions of the C. W. I. N. C. L.S.  2. Main canals and Branches — Soil surveys L.S.	Ra. 2,500 19,000 12,640	
Discharge and silt Observations	4,570 1,000 10,000 11,000	
7. Contingencies 2 per cent	1,250	
Total Works	61,960	
I. TOOLS AND PLANT 6 weapon carriers at Rs. 7,000 each	42,000	
2 jeeps with trailers at Rs. 7,000 each	14,000	
2 country boats at Rs. 1,000 each	2,000	
3 outboard motors at Rs. 1,000 each	3,000	
6 chronographs at Rs. 100 each	600	
8 levelling instruments at Rs. 800 each	6,400	
1 theodolite at Rs. 1,500	1,500	
1 Binocular at Rs. 200	200	
8 measuring chains at Rs. 15 each	120	
30-100 ft. tapes at Rs. 30 each	900	
30-50 ft. tapes at Rs. 20 each	. 600	
3 steel tapes at Rs. 100 each	300	
5 Drawing boards at Rs. 30 each	150	
5 second class drawing instruments boxes at Rs. 200 each	1,000	
2 First class drawing instruments boxes at Rs. 300 each	600	
tools and plant	800	
8 current meters at Rs. 1,000 each	8,000	
6 large boats for discharge observations at Rs. 1,000 each	6,000	
6 small boats at Rs. 500 each	3,000	
Discharge rods	800	
Ropes	4,000	
1 set of laboratory apparatus for silt observations at Rs. 1,500	1,500	
Recurring laboratory equipment		20
14 by 14 tents 5 Nos. at Rs. 1,200 each 10 by 10 tents 15 Nos. at Rs. 800 each	6,000 12,000	
15 shouldaries at Rs. 600 each	9,000 9,000	
Camp furniture L. S	(4,000	
Office furniture for Divisional and Sub-Divl. offices	9,000	
Office furniture for soil physicist's office and laboratory Office furniture for geologist's office	1 <b>3,0</b> 00 <b>2,996</b>	
Total	1,52,436	20
(b) Repairs and Carriage—Repairs to Trucks	1,02,200	1,000
(c) Contingencies 2 per cent	3,049	_,,000
(c) Contingencies 2 per cent		

#### III. ESTABLISHMENT

3 Laboratory Assistants for 4 months @ 100 p.m.  2 Clerks for 4 months @ 40 p.m.  1 Computor for 4 months @ 40 p.m.  1 Tracer for 4 months @ 40 p.m.  3 Laboratory peons for 4 months @ 25 p.m.  2 Peons for 4 months @ 25 p.m.  1 Tapali for 4 months @ 25 p.m.  4 Auger measurers for 4 months @ 40 p.m.  Total  Dearness allowances and Special Pay of Officers L. S.  Dearness allowance of establishment L. S.  Travelling allowance of officers  1 Executive Engineer  2 Assistant Engineers  1 Geologist	I. ESTABLISHMENT												
2 Assistant Engineers at Rs. 280 p.m. 1,800 1 Geologist for 3 months at Rs. 600 p.m. 1,800 1 Boil Physichat for 4 mothts at Rs. 275 p.m. 7,700  Pay of establishmeht 5 Overseers for 3 months @ 180 p.m. 1 1 Head clerk for 3 months @ 180 p.m. 1 1 Accountant for 3 months @ 200 p.m. 1 2 Clerks for 3 months @ 200 p.m. 1 2 Clerks for 3 months @ 80 p.m. 4 2 Sub-Divil. clerks for 3 months @ 100 p.m. 1 1 Dispenser for 1 month @ 30 p.m. 1 1 Dispenser for 1 month @ 30 p.m. 2 2 Tracers for 3 months @ 30 p.m. 2 2 Barkandazes for 1 month @ 30 p.m. 4 2 Peons for 3 months @ 30 p.m. 5 2 Barkandazes for 3 months @ 30 p.m. 6 3 Gauge réaders for 3 months @ 30 p.m. 6 5 Khalasis for 3 months @ 30 p.m. 7 5 Khalasis for 3 months @ 30 p.m. 1 5 Clerks for 3 months @ 30 p.m. 1 5 Clerks for 3 months @ 30 p.m. 1 5 Clerks for 4 months @ 40 p.m. 1 1 Tracer for 4 months @ 40 p.m. 1 1 Tracer for 4 months @ 40 p.m. 1 1 Tracer for 4 months @ 40 p.m. 1 1 Tracer for 4 months @ 40 p.m. 1 1 Tracer for 4 months @ 40 p.m. 1 1 Tracer for 4 months @ 40 p.m. 1 1 Tracer for 4 months @ 40 p.m. 1 1 Tracer for 4 months @ 40 p.m. 1 1 Tracer for 4 months @ 40 p.m. 1 1 Tracer for 4 months @ 40 p.m. 1 1 Tracer for 4 months @ 40 p.m. 1 1 Tracer for 4 months @ 40 p.m. 1 1 Tracer for 4 months @ 40 p.m. 1 1 Tracer for 4 months @ 40 p.m. 1 1 Tracer for 4 months @ 40 p.m. 1 1 Tracer for 5 months @ 40 p.m. 1 1 Tracer for 6 months @ 40 p.m. 1 1 Tracer for 6 months @ 40 p.m. 1 1 Tracer for 6 months @ 40 p.m. 1 1 Tracer for 6 months @ 40 p.m. 1 1 Tracer for 6 months @ 40 p.m. 1 1 Tracer for 6 months @ 40 p.m. 1 1 Tracer for 6 months @ 40 p.m. 1 1 Tracer for 6 months @ 40 p.m. 1 1 Tracer for 6 months @ 5 p.m. 2 1 Peons for 8 months @ 5 p.m. 4 2 Peons for 8 months @ 5 p.m. 4 3 Laboratory peons for 4 months @ 5 p.m. 5 4 Nonths @ 5 p.m. 6 5 Universely peons for 6 months @ 5 p.m. 6 5 Universely peons for 6 months @ 5 p.m. 6 5 Universely peons for 6 months @ 5 p.m. 6 5 Universely peons for 6 months @ 5 p.m. 6 5 Universely peons for 6 months @ 5 p.m. 6 5 Universely peons for 6 mo	(a) Pay of officers					\							
1 Geologist for 3 months at Rs. 600 p.m. 1 Soil Physichst for 4 months at Rs. 275 p.m. 1,100  Total 7,700  Pay of establishmeht 5 Overseers for 3 months @ 180 p.m. 1 Head clerk for 3 months @ 180 p.m. 1 Accountant for 3 months @ 200 p.m. 1 Sub-Assistant Surgeon for 1 month @ 200 p.m. 2 Clerks for 3 months @ 30 p.m. 4 Sub-Divl. clerks for 3 months @ 100 p.m. 1 Junior Draftsman for 3 months @ 100 p.m. 2 Tracers for 3 months @ 80 p.m. 1 Daffadar for 1 month @ 35 p.m. 2 Barkandazes for 1 month @ 35 p.m. 2 Barkandazes for 1 month @ 30 p.m. 4 Pecans for 3 months for overseers @ 30 p.m. 2 Dak runners for 3 months @ 30 p.m. 3 Gauge réaders for 3 months @ 30 p.m. Ceologist staff L. S. 6 Sub-overseers for 4 months @ 30 p.m. 1 Computor for 4 months @ 40 p.m. 1 Tracer for 4 months @ 40 p.m. 2 Peons for 4 months @ 40 p.m. 3 Laboratory peons for 4 months @ 55 p.m. 4 Auger measurers for 4 months @ 50 p.m. 5 Travelling allowance of officers 1 Executive Engineer 1 Executive Engineer 1 Caelogist	_		00 p.m.						•		2,700		
1 Soil Physicht for 4 months at Rs. 275 p.m.  Total  7,700  Total  7,100  Total  7,100			• •	•			•	•	•				
Total 7,700  Pay of establishmeht  5 Overseers for 3 months @ 180 p.m.  1 Head clerk for 3 months @ 200 p.m.  1 Sub-Assistant Surgeon for 1 month @ 200 p.m.  1 Sub-Assistant Surgeon for 1 month @ 200 p.m.  2 Clerks for 3 months @ 80 p.m.  4 Sub-Divl. clerks for 3 months @ 100 p.m.  1 Junior Draftsman for 3 months @ 100 p.m.  2 Tracers for 1 month @ 35 p.m.  1 Daffiedar for 1 month @ 35 p.m.  2 Barkandazes for 1 month @ 30 p.m.  4 Peons for 3 months @ 30 p.m.  2 Peons for 3 months for officers @ 30 p.m.  2 Dak runners for 3 months @ 30 p.m.  3 Gauge readers for 3 months @ 30 p.m.  Geologiste' staff L. S.  6 Sub-overseers for 4 months @ 30 p.m.  1 Computor for 4 months @ 40 p.m.  1 Tracer for 4 months @ 40 p.m.  2 Dearness allowance of establishment L. S.  Travelling allowance of establishment L. S.  Travelling allowance of establishment L. S.	-		 1		•		•	•			-		
Pay of establishmeht  5 Overseers for 3 months @ 180 p.m.  1 Head clerk for 3 months @ 200 p.m.  1 Sub-Assistant Surgeon for 1 month @ 200 p.m.  2 Clecks for 3 months @ 80 p.m.  4 Sub-Divl. clerks for 3 months @ 100 p.m.  1 Junior Draftsman for 3 months @ 100 p.m.  2 Tracers for 3 months @ 80 p.m.  1 Daffidar for 1 month @ 35 p.m.  2 Barkandazes for 1 month @ 30 p.m.  4 Peons for 3 months @ 30 p.m.  2 Peons for 3 months @ 30 p.m.  5 Khalasis for 3 months @ 30 p.m.  6 Khalasis for 3 months @ 30 p.m.  6 Khalasis for 3 months @ 30 p.m.  Coclogists' staff L. S.  6 Sub-overseers for 4 months @ 30 p.m.  1 Computor for 4 months @ 40 p.m.  1 Tracer for 4 months @ 40 p.m.  2 Peons for 4 months @ 50 p.m.  2 Peons for 4 months @ 50 p.m.  2 Peons for 5 months @ 50 p.m.  2 Peons for 5 months @ 50 p.m.  3 Laboratory peons for 6 months @ 50 p.m.  1 Tracer for 6 months @ 50 p.m.  2 Peons for 6 months @ 50 p.m.  1 Tracer for 6 months @ 50 p.m.  2 Peons for 6 months @ 50 p.m.  1 Tracer for 6 months @ 50 p.m.  2 Peons for 6 months @ 50 p.m.  1 Tracer for 6 months @ 50 p.m.  2 Peons for 6 months @ 50 p.m.  1 Tracer for 6 months @ 50 p.m.  2 Peons for 6 months @ 50 p.m.  1 Tracer for 6 months @ 50 p.m.  2 Peons for 6 months @ 50 p.m.  3 Laboratory for 6 m		٠,	•	•	,	To	tal		-	-			
1 Head clerk for 3 months @ 160 p.m. 1 Accountant for 3 months @ 200 p.m. 1 Sub-Assistant Surgeon for 1 month @ 200 p.m. 2 Clorks for 3 months @ 80 p.m. 4 Sub-Divl. clerks for 3 months @ 75 p.m. 1 Junior Draftsman for 3 months @ 100 p.m. 2 Tracers for 3 months @ 80 p.m. 1 Dispenser for 1 month @ 80 p.m. 1 Dispenser for 1 month @ 35 p.m. 2 Barkandazes for 1 month @ 30 p.m. 2 Peons for 3 months @ 30 p.m. 2 Peons for 3 months @ 30 p.m. 3 Cauge réaders for 3 months @ 30 p.m. 5 Khalasis for 3 months for overseers @ 30 p.m. 6 Khalasis for 3 months for overseers @ 30 p.m. 6 Ceologiste' staff L. S. 6 Sub-overseers for 4 months @ 30 p.m. 1 Tracer for 4 months @ 40 p.m. 1 Computor for 4 months @ 40 p.m. 1 Tracer for 4 months @ 40 p.m. 1 Tracer for 4 months @ 40 p.m. 1 Tapali for 4 months @ 25 p.m. 2 Peons for 4 months @ 25 p.m. 4 Auger measurers for 4 months @ 40 p.m. 5 Total  Dearness allowances and Special Pay of Officers L. S. Dearness allowance of establishment L. S. Travelling allowance of officers 1 Executive Engineer 1 Executive Engineer 1 Geologist 1 Geologist	Pay of establishment										,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
1 Accountant for 3 months @ 200 p.m. 1 Sub-Assistant Surgeon for 1 month @ 200 p.m. 2 Clerks for 3 months @ 80 p.m. 4 Sub-Divl. clerks for 3 months @ 15 p.m. 1 Junior Drafteman for 3 months @ 100 p.m. 2 Tracers for 3 months @ 80 p.m. 1 Dispenser for 1 month @ 85 p.m. 2 Barkandazes for 1 month @ 30 p.m. 4 Peons for 3 months @ 30 p.m. 2 Peons for 3 months @ 30 p.m. 5 Khalasis for 3 months @ 30 p.m. 5 Khalasis for 3 months @ 30 p.m. 6 Sub-overseers for 4 months @ 30 p.m. 7 Laboratory Assistants for 4 months @ 100 p.m. 8 Laboratory Assistants for 4 months @ 100 p.m. 1 Tracer for 4 months @ 40 p.m. 1 Tracer for 4 months @ 40 p.m. 1 Tapali for 4 months @ 25 p.m. 2 Peons for 4 months @ 25 p.m. 4 Auger measurers for 4 months @ 40 p.m. 5 Travelling allowances and Special Pay of Officers L. S. 5 Dearness allowances and Special Pay of Officers L. S. 5 Dearness allowances of officers 1 Executive Engineer 2 Assistant Engineers 1 Geologist	5 Overseers for 3 months @ 180 p.m.				•		•						2,70
1 Sub-Assistant Surgeon for I month @ 200 p.m. 2 Clerks for 3 months @ 80 p.m. 4 Sub-Divl. clerks for 3 months @ 100 p.m. 1 Junior Draftaman for 3 months @ 100 p.m. 2 Tracers for 3 months @ 80 p.m. 1 Dispenser for I month @ 80 p.m. 1 Daffadar for I month @ 80 p.m. 2 Barkandzes for I month @ 35 p.m. 2 Barkandzes for I month @ 30 p.m. 2 Peons for 3 months @ 30 p.m. 2 Peons for 3 months @ 30 p.m. 2 Peons for 3 months for officers @ 30 p.m. 3 Gauge réaders for 3 months @ 30 p.m. 6 Khalasis for 3 months for overseers @ 30 p.m. 6 Sub-overseers for 4 months @ 30 p.m. 7 Geologists' staff L. S. 6 Sub-overseers for 4 months @ 50 p.m. 1 Laboratory Assistants for 4 months @ 100 p.m. 1 Computor for 4 months @ 40 p.m. 1 Tracer for 4 months @ 40 p.m. 1 Tracer for 4 months @ 25 p.m. 1 Tapali for 4 months @ 26 p.m. 1 Dearness allowances and Special Pay of Officers L. S. Dearness allowance of establishment L. S. Travelling allowance of officers 1 Executive Engineer 2 Assistant Engineers 1 Geologist	1 Head clerk for 3 months @ 160 p.m	ı											48
1 Sub-Assistant Surgeon for 1 month @ 200 p.m. 2 Clerks for 3 months @ 80 p.m. 4 Sub-Divl. clerks for 3 months @ 150 p.m. 1 Junior Drafteman for 3 months @ 100 p.m. 2 Tracers for 3 months @ 80 p.m. 1 Dispenser for 1 month @ 80 p.m. 1 Daffadar for 1 month @ 35 p.m. 2 Barkadzes for 1 month @ 35 p.m. 2 Barkadzes for 1 month @ 30 p.m. 4 Peons for 3 months @ 30 p.m. 2 Peons for 3 months for officers @ 30 p.m. 2 Dak runners for 3 months for overseers @ 30 p.m. 3 Gauge réaders for 3 months @ 30 p.m. Geologists' staff L. S. 6 Sub-overseers for 4 months @ 50 p.m. 3 Laboratory Assistants for 4 months @ 100 p.m. 1 Computor for 4 months @ 40 p.m. 1 Tracer for 4 months @ 40 p.m. 1 Tracer for 4 months @ 25 p.m. 2 Peons for 4 months @ 25 p.m. 1 Tapali for 4 months @ 25 p.m. 1 Tapali for 4 months @ 25 p.m. 2 Peons for 4 months @ 25 p.m. 4 Auger measurers for 4 months @ 40 p.m. Total  Dearness allowances and Special Pay of Officers L. S. Dearness allowance of establishment L. S. Travelling allowance of officers 1 Executive Engineers 2 Assistant Engineers 1 Geologist	1 Accountant for 3 months @ 200 p.s	m										·	60
2 Clerks for 3 months @ 80 p.m. 4 Sub-Divl. elerks for 3 months @ 75 p.m. 1 Junior Drafteman for 3 months @ 100 p.m. 2 Tracers for 3 months @ 80 p.m. 1 Dispenser for 1 month @ 80 p.m. 1 Daffadar for 1 month @ 35 p.m. 2 Barkandazes for 1 month @ 35 p.m. 2 Barkandazes for 1 month @ 30 p.m. 2 Peons for 3 months @ 30 p.m. 2 Peons for 3 months for officers @ 30 p.m. 2 Dak runners for 3 months for overseers @ 30 p.m. 3 Gauge readers for 3 months @ 30 p.m. 6 Khalasis for 3 months @ 30 p.m. Geologists' staff L. S. 6 Sub-overseers for 4 months @ 50 p.m. 3 Laboratory Assistants for 4 months @ 100 p.m. 1 Computor for 4 months @ 40 p.m. 1 Tracer for 4 months @ 40 p.m. 1 Tracer for 4 months @ 25 p.m. 2 Peons for 4 months @ 25 p.m. 1 Tapali for 4 months @ 25 p.m. 1 Tapali for 4 months @ 25 p.m. 4 Auger measurers for 4 months @ 40 p.m. Total  Dearness allowances and Special Pay of Officers L. S. Dearness allowance of establishment L. S. Travelling allowance of officers 1 Executive Engineers 1 Geologist 1 Geologist	T		) p.m.								•	•	20
4 Sub-Divl. clerks for 3 months @ 75 p.m.  1 Junior Draftsman for 3 months @ 100 p.m.  2 Tracers for 3 months @ 80 p.m.  1 Dispenser for 1 month @ 80 p.m.  1 Daffadar for 1 month @ 35 p.m.  2 Barkandazes for 1 month @ 30 p.m.  4 Peons for 3 months @ 30 p.m.  2 Peons for 3 months @ 30 p.m.  2 Peons for 3 months for officers @ 30 p.m.  5 Khalasis for 3 months @ 30 p.m.  6 Khalasis for 3 months @ 30 p.m.  6 Sub-overseers for 3 months @ 30 p.m.  Ceologists' staff L. S.  6 Sub-overseers for 4 months @ 50 p.m.  1 Laboratory Assistants for 4 months @ 100 p.m.  2 Clerks for 4 months @ 40 p.m.  1 Tracer for 4 months @ 40 p.m.  1 Tracer for 4 months @ 25 p.m.  2 Peons for 4 months @ 25 p.m.  1 Tapali for 4 months @ 25 p.m.  4 Auger measurers for 4 months @ 40 p.m.  Total  Dearness allowances and Special Pay of Officers L. S.  Dearness allowance of establishment L. S.  Travelling allowance of officers  1 Executive Engineer  2 Assistant Engineers  1 Geologist						·		·		•	•	•	48
1 Junior Draftsman for 3 months @ 100 p.m. 2 Tracers for 3 months @ 80 p.m. 1 Dispenser for 1 month @ 80 p.m. 1 Daffadar for 1 month @ 35 p.m. 2 Barkandazes for 1 month @ 30 p.m. 4 Peons for 3 months @ 30 p.m. 2 Peons for 3 months @ 30 p.m. 2 Peons for 3 months @ 30 p.m. 2 Dak runners for 3 months @ 30 p.m. 5 Khalasis for 3 months @ 30 p.m. 6 Gauge réaders for 3 months @ 30 p.m. 6 Gologists' staff L. S. 6 Sub-overseers for 4 months @ 50 p.m. 1 Laboratory Assistants for 4 months @ 100 p.m. 2 Clerks for 4 months @ 40 p.m. 1 Tracer for 4 months @ 40 p.m. 1 Tracer for 4 months @ 40 p.m. 1 Tracer for 4 months @ 25 p.m. 2 Peons for 4 months @ 25 p.m. 1 Tapali for 4 months @ 25 p.m. 4 Auger measurers for 4 months @ 40 p.m. Total  Dearness allowances and Special Pay of Officers L. S. Dearness allowance of establishment L. S. Travelling allowance of officers 1 Executive Engineer 2 Assistant Engineers 1 Geologist	• •	n m.		•	•	•	•	•	•	•	•	•	
2 Tracers for 3 months @ 80 p.m.  1 Disponser for 1 month @ 35 p.m.  2 Barkandazes for 1 month @ 30 p.m.  4 Peons for 3 months @ 30 p.m.  2 Peons for 3 months for officers @ 30 p.m.  2 Dak runners for 3 months @ 30 p.m.  5 Khalasis for 3 months for overseers @ 30 p.m.  6 Khalasis for 3 months @ 30 p.m.  7 Geologists' staff L. S.  6 Sub-overseers for 4 months @ 50 p.m.  9 Laboratory Assistants for 4 months @ 100 p.m.  1 Computor for 4 months @ 40 p.m.  1 Tracer for 4 months @ 40 p.m.  1 Tracer for 4 months @ 40 p.m.  1 Tapali for 4 months @ 25 p.m.  2 Peons for 4 months @ 25 p.m.  1 Tapali for 4 months @ 25 p.m.  1 Tapali for 4 months @ 25 p.m.  1 Tapali for 4 months @ 40 p.m.  Total  Dearness allowance and Special Pay of Officers L. S.  Dearness allowance of establishment L. S.  Travelling allowance of officers  1 Executive Engineer  2 Assistant Engineers  1 Geologist	•	-	,	•	•	•	•	•	•	•	•	•	90
1 Dispenser for 1 month @ 80 p.m.  1 Daffadar for 1 month @ 35 p.m.  2 Barkandazes for 1 month @ 30 p.m.  4 Peons for 3 months @ 30 p.m.  2 Peons for 3 months for officers @ 30 p.m.  2 Dak runners for 3 months @ 30 p.m.  5 Khalasis for 3 months for overseers @ 30 p.m.  6 Khalasis for 3 months @ 30 p.m.  6 Sub-overseers for 3 months @ 30 p.m.  7 Geologists' staff L. S.  6 Sub-overseers for 4 months @ 50 p.m.  9 Laboratory Assistants for 4 months @ 100 p.m.  1 Computor for 4 months @ 40 p.m.  1 Tracer for 4 months @ 40 p.m.  1 Tracer for 4 months @ 40 p.m.  1 Tapali for 4 months @ 25 p.m.  2 Peons for 4 months @ 25 p.m.  1 Tapali for 4 months @ 25 p.m.  4 Auger measurers for 4 months @ 40 p.m.  Total  Dearness allowance of establishment L. S.  Travelling allowance of officers  1 Executive Engineers  1 Geologist  1 Geologist		roo p.n	ш	•	•	•	•	•	•	•	•	•	30
1 Daffadar for 1 month @ 35 p.m. 2 Barkandazes for 1 month @ 30 p.m. 4 Peons for 3 months @ 30 p.m. 2 Peons for 3 months for officers @ 30 p.m. 2 Dak runners for 3 months @ 30 p.m. 5 Khalasis for 3 months for overseers @ 30 p.m. 6 Khalasis for 3 months @ 30 p.m. 6 Sub-overseers for 3 months @ 30 p.m. 7 Laboratory Assistants for 4 months @ 50 p.m. 8 Laboratory Assistants for 4 months @ 100 p.m. 1 Computor for 4 months @ 40 p.m. 1 Tracer for 4 months @ 40 p.m. 1 Tracer for 4 months @ 25 p.m. 2 Peons for 4 months @ 25 p.m. 1 Tapali for 4 months @ 25 p.m. 2 Peons for 4 months @ 25 p.m. 1 Tapali for 4 months @ 25 p.m. 2 Peons for 4 months @ 25 p.m. 1 Tapali for 4 months @ 25 p.m. 2 Peons for 4 months @ 25 p.m. 1 Tapali for 4 months @ 25 p.m. 2 Peons for 4 months @ 25 p.m. 1 Tapali for 4 months @ 25 p.m. 2 Peons for 4 months @ 25 p.m. 3 Laboratory peons for 4 months @ 40 p.m.		•	•	•	•	•	•	•	•	•	•	•	480
2 Barkandazes for 1 month @ 30 p.m. 4 Peons for 3 months @ 30 p.m. 2 Peons for 3 months for officers @ 30 p.m. 2 Dak runners for 3 months @ 30 p.m. 5 Khalasis for 3 months for overseers @ 30 p.m. 6 Khalasis for 3 months @ 30 p.m. 6 Gauge readers for 3 months @ 30 p.m. 7 Geologists' staff L. S. 6 Sub-overseers for 4 months @ 50 p.m. 8 Laboratory Assistants for 4 months @ 100 p.m. 1 Computor for 4 months @ 40 p.m. 1 Tracer for 4 months @ 40 p.m. 1 Tracer for 4 months @ 40 p.m. 1 Tapali for 4 months @ 25 p.m. 1 Tapali for 4 months @ 25 p.m. 1 Tapali for 4 months @ 25 p.m. 1 Tapali for 4 months @ 26 p.m. 1 Tapali for 4 months @ 26 p.m. 2 Peons for 4 months @ 26 p.m. 1 Tapali for 4 months @ 26 p.m. 1 Tapali for 4 months @ 26 p.m. 2 Auger measurers for 4 months @ 40 p.m.  Total  Dearness allowance and Special Pay of Officers L. S. Dearness allowance of officers 1 Executive Engineer 2 Assistant Engineers 1 Geologist		•	•	•	•	•	•	•	•	•	•	•	80
4 Peons for 3 months @ 30 p.m.  2 Peons for 3 months for officers @ 30 p.m.  2 Dak runners for 3 months @ 30 p.m.  5 Khalasis for 3 months for overseers @ 30 p.m.  6 Khalasis for 3 months @ 30 p.m.  Geologists' staff L. S.  6 Sub-overseers for 4 months @ 50 p.m.  1 Laboratory Assistants for 4 months @ 100 p.m.  2 Clerks for 4 months @ 40 p.m.  1 Computor for 4 months @ 40 p.m.  1 Tracer for 4 months @ 40 p.m.  2 Peons for 4 months @ 25 p.m.  1 Tapali for 4 months @ 25 p.m.  4 Auger measurers for 4 months @ 40 p.m.  Total  Dearness allowances and Special Pay of Officers L. S.  Dearness allowance of establishment L. S.  Travelling allowance of officers  1 Executive Engineer  2 Assistant Engineers  1 Geologist	· -	•	•	masa.	•	•	•	•	•	•	•	•	36
2 Peons for 3 months for officers @ 30 p.m. 2 Dak runners for 3 months @ 30 p.m. 5 Khalasis for 3 months for overseers @ 30 p.m. 3 Gauge réaders for 3 months @ 30 p.m. Geologists' staff L. S. 6 Sub-overseers for 4 months @ 50 p.m. 3 Laboratory Assistants for 4 months @ 100 p.m. 2 Clerks for 4 months @ 40 p.m. 1 Computor for 4 months @ 40 p.m. 1 Tracer for 4 months @ 40 p.m. 2 Peons for 4 months @ 25 p.m. 2 Peons for 4 months @ 25 p.m. 1 Tapali for 4 months @ 25 p.m. 4 Auger measurers for 4 months @ 40 p.m. Total  Dearness allowances and Special Pay of Officers L. S. Dearness allowance of establishment L. S. Travelling allowance of officers 1 Executive Engineer 2 Assistant Engineers 1 Geologist			arial is		13		•	•	•	•	•	•	60
2 Dak runners for 3 months @ 30 p.m.  5 Khalasis for 3 months for overseers @ 30 p.m.  3 Gauge réaders for 3 months @ 30 p.m.  Geologists' staff L. S.  6 Sub-overseers for 4 months @ 50 p.m.  3 Laboratory Assistants for 4 months @ 100 p.m.  2 Clerks for 4 months @ 40 p.m.  1 Computor for 4 months @ 40 p.m.  1 Tracer for 4 months @ 40 p.m.  2 Peons for 4 months @ 25 p.m.  2 Peons for 4 months @ 25 p.m.  1 Tapali for 4 months @ 25 p.m.  4 Auger measurers for 4 months @ 40 p.m.  Total  Dearness allowances and Special Pay of Officers L. S.  Dearness allowance of establishment L. S.  Travelling allowance of officers  1 Executive Engineer  2 Assistant Engineers  1 Geologist					協	þ.	. •	•	•	, •	•	•	360
5 Khalasis for 3 months for overseers @ 30 p.m.  3 Gauge réaders for 3 months @ 30 p.m.  Geologists' staff L. S.  6 Sub-overseers for 4 months @ 50 p.m.  3 Laboratory Assistants for 4 months @ 100 p.m.  2 Clerks for 4 months @ 40 p.m.  1 Computor for 4 months @ 40 p.m.  1 Tracer for 4 months @ 40 p.m.  2 Peons for 4 months @ 25 p.m.  2 Peons for 4 months @ 25 p.m.  1 Tapali for 4 months @ 25 p.m.  4 Auger measurers for 4 months @ 40 p.m.  Total  Dearness allowances and Special Pay of Officers L. S.  Dearness allowance of establishment L. S.  Travelling allowance of officers  1 Executive Engineer  2 Assistant Engineers  1 Geologist	2 Peons for 3 months for officers @ 30	) p.m.					•	. •	•	•	• .	•	180
3 Gauge readers for 3 months @ 30 p.m.  Geologists' staff L. S.  6 Sub-overseers for 4 months @ 50 p.m.  3 Laboratory Assistants for 4 months @ 100 p.m.  2 Clerks for 4 months @ 40 p.m.  1 Computor for 4 months @ 40 p.m.  1 Tracer for 4 months @ 40 p.m.  3 Laboratory peons for 4 months @ 25 p.m.  2 Peons for 4 months @ 25 p.m.  1 Tapali for 4 months @ 25 p.m.  4 Auger measurers for 4 months @ 40 p.m.  Total  Dearness allowances and Special Pay of Officers L. S.  Dearness allowance of establishment L. S.  Travelling allowance of officers  1 Executive Engineer  2 Assistant Engineers  1 Geologist	2 Dak runners for 3 months @ 30 p.m	ı				•	•		•	•	•		180
Geologists' staff L. S.  6 Sub-overseers for 4 months @ 50 p.m.  3 Laboratory Assistants for 4 months @ 100 p.m.  2 Clerks for 4 months @ 40 p.m.  1 Computor for 4 months @ 40 p.m.  1 Tracer for 4 months @ 40 p.m.  3 Laboratory peons for 4 months @ 25 p.m.  2 Peons for 4 months @ 25 p.m.  1 Tapali for 4 months @ 25 p.m.  4 Auger measurers for 4 months @ 40 p.m.  Total  Dearness allowances and Special Pay of Officers L. S.  Dearness allowance of establishment L. S.  Travelling allowance of officers  1 Executive Engineer  2 Assistant Engineers  1 Geologist	5 Khalasis for 3 months for overseers	@ 30 j	p.m.				•		•	•			450
6 Sub-overseers for 4 months @ 50 p.m. 3 Laboratory Assistants for 4 months @ 100 p.m. 2 Clerks for 4 months @ 40 p.m. 1 Computor for 4 months @ 40 p.m. 1 Tracer for 4 months @ 40 p.m. 3 Laboratory peons for 4 months @ 25 p.m. 2 Peons for 4 months @ 25 p.m. 1 Tapali for 4 months @ 25 p.m. 4 Auger measurers for 4 months @ 40 p.m.  Total  Dearness allowances and Special Pay of Officers L. S. Dearness allowance of establishment L. S.  Travelling allowance of officers 1 Executive Engineer 2 Assistant Engineers 1 Geologist	3 Gauge readers for 3 months @ 30 p.	m					, •		•				270
3 Leboratory Assistants for 4 months @ 100 p.m.  2 Clerks for 4 months @ 40 p.m.  1 Computor for 4 months @ 40 p.m.  1 Tracer for 4 months @ 40 p.m.  3 Laboratory peons for 4 months @ 25 p.m.  2 Peons for 4 months @ 25 p.m.  1 Tapali for 4 months @ 25 p.m.  4 Auger measurers for 4 months @ 40 p.m.  Total  Dearness allowances and Special Pay of Officers L. S.  Dearness allowance of establishment L. S.  Travelling allowance of officers  1 Executive Engineer  2 Assistant Engineers  1 Geologist	Geologists' staff L. S	•		1.14						•			600
3 Laboratory Assistants for 4 months @ 100 p.m.  2 Clerks for 4 months @ 40 p.m.  1 Computor for 4 months @ 40 p.m.  1 Tracer for 4 months @ 40 p.m.  3 Laboratory peons for 4 months @ 25 p.m.  2 Peons for 4 months @ 25 p.m.  1 Tapali for 4 months @ 25 p.m.  4 Auger measurers for 4 months @ 40 p.m.  Total  Dearness allowances and Special Pay of Officers L. S.  Dearness allowance of establishment L. S.  Travelling allowance of officers  1 Executive Engineer  2 Assistant Engineers  1 Geologist	6 Sub-overseers for 4 months @ 50 p.n	n '	C. Ju	is d			٠.						1,200
2 Clerks for 4 months @ 40 p.m.  1 Computor for 4 months @ 40 p.m.  1 Tracer for 4 months @ 40 p.m.  3 Laboratory peons for 4 months @ 25 p.m.  2 Peons for 4 months @ 25 p.m.  1 Tapali for 4 months @ 25 p.m.  4 Auger measurers for 4 months @ 40 p.m.  Total  Dearness allowances and Special Pay of Officers L. S.  Dearness allowance of establishment L. S.  Travelling allowance of officers  1 Executive Engineer  2 Assistant Engineers  1 Geologist	3 Laboratory Assistants for 4 months	@ 100	p.m.		-								1,200
1 Tracer for 4 months @ 40 p.m. 3 Laboratory peons for 4 months @ 25 p.m. 2 Peons for 4 months @ 25 p.m. 1 Tapali for 4 months @ 25 p.m. 4 Auger measurers for 4 months @ 40 p.m.  Total  Dearness allowances and Special Pay of Officers L. S. Dearness allowance of establishment L. S.  Travelling allowance of officers  1 Executive Engineer  2 Assistant Engineers  1 Geologist	2 Clerks for 4 months @ 40 p.m.		वदा	19 3	3-							•	320
1 Tracer for 4 months @ 40 p.m. 3 Laboratory peons for 4 months @ 25 p.m. 2 Peons for 4 months @ 25 p.m. 1 Tapali for 4 months @ 25 p.m. 4 Auger measurers for 4 months @ 40 p.m.  Total  Dearness allowances and Special Pay of Officers L. S. Dearness allowance of establishment L. S.  Travelling allowance of officers  1 Executive Engineer  2 Assistant Engineers  1 Geologist	•										•	•	
3 Laboratory peons for 4 months @ 25 p.m.  2 Peons for 4 months @ 25 p.m.  1 Tapali for 4 months @ 25 p.m.  4 Auger measurers for 4 months @ 40 p.m.  Total  Dearness allowances and Special Pay of Officers L. S.  Dearness allowance of establishment L. S.  Travelling allowance of officers  1 Executive Engineer  2 Assistant Engineers  1 Geologist	•			i			Ī	•	•	•	•	•	160
2 Peons for 4 months @ 25 p.m.  1 Tapali for 4 months @ 25 p.m.  4 Auger measurers for 4 months @ 40 p.m.  Total  Dearness allowances and Special Pay of Officers L. S.  Dearness allowance of establishment L. S.  Travelling allowance of officers  1 Executive Engineer  2 Assistant Engineers  1 Geologist		Knm	•	•	•	•	•	•	•	•	•	•	160
1 Tapali for 4 months @ 25 p.m. 4 Auger measurers for 4 months @ 40 p.m.  Total  Dearness allowances and Special Pay of Officers L. S.  Dearness allowance of establishment L. S.  Travelling allowance of officers  1 Executive Engineer  2 Assistant Engineers  1 Geologist		, р.ш.		•	•	•		•	•	•	•	•	300
4 Auger measurers for 4 months @ 40 p.m.  Total  Dearness allowances and Special Pay of Officers L. S.  Dearness allowance of establishment L. S.  Travelling allowance of officers  1 Executive Engineer  2 Assistant Engineers  1 Geologist		•	•	•	•	•	•	. <b>*</b>	•	•	•	• .	200
Dearness allowances and Special Pay of Officers L. S.  Dearness allowance of establishment L. S.  Travelling allowance of officers  1 Executive Engineer  2 Assistant Engineers  1 Geologist		n.m	•	•	•	•	•	. •	· •	. •	, •	•	100
Dearness allowances and Special Pay of Officers L. S.  Dearness allowance of establishment L. S.  Travelling allowance of officers  1 Executive Engineer  2 Assistant Engineers  1 Geologist	- 110got	P		•	•	•	•	•	•	•	•	• _	640
Dearness allowance of establishment L. S.  Travelling allowance of officers  1 Executive Engineer  2 Assistant Engineers  1 Geologist								Tota	1	•	•	•_	12,630
Dearness allowance of establishment L. S.  Travelling allowance of officers  1 Executive Engineer  2 Assistant Engineers  1 Geologist	Dearness allowances and Special Pay of	f Office	rs L. S.					• ,					1,965
Travelling allowance of officers  1 Executive Engineer  2 Assistant Engineers  1 Geologist		S.	•	•			•	•	•	•	•		8,000
2 Assistant Engineers 1 Geologist													
1 Geologist		•	•	•	•	•	•	•	•	•	•	•	800
9 G 21 Th		•	•	•	•	•	•	•	•	•	•	•	800
	•	•	•	•	•	•	:	•	•	•	•	•	1,800 1,750
· · · · · · · · · · · · · · · · · · ·					-		-	*	-	•	٠	· _	-,100

Travell	ling allowance o	f esta	blish	ment													
	Supe visors		•	•	•	•	•	•	•		•	•	•	•	•	•	1,200
•	Other staff (I	Execu	tive l	Engin	eer)	•	•		•		•	•	•		•		1,600
Ge	ologist—Other	staff	•	•	•	•	•	•	•	•				•	•	•	200
	Sub-overseers		•	•	•	•	•	•			•	•			•	•	600
Αι	iger measures	•	•	.`		•	٠	•	•	•	•	•	•		•		600
	Other Staff	•	·	•,	•,	•.	•.	•	•.	•.	•.	•,		•		•	, <b>500</b>
																_	4,700
(b) Est	ablishment Conti	ngene	ies													_	
Re	ent for Divisions	al and	8ub	Divis	ional	offices		•	•								1,000
Re	ent for Soil Phys	icist'	s offic	co and	labo	ratory	•								•		500
Re	ent for Geologia	t's off	loe			•	•										250
																_	1,750
						7	Cotal	of est	ablish	ment	•						41,895



III. ESTIMATE FOR THE PRELIMINARY SURVEY AND INVESTIGATIONS WITH THE PROJECTS FOR MULTI-PURPOSE DEVELOPMENT IN THE BASIN OF THE TAPTI RIVER FOR THE YEAR 1948-49 SUBMITTED TO GOVERNMENT FOR SANCTION.

					ABS	TRA	CT								
													$\mathbf{R}\mathbf{s}$		
I. WORKS	•.	•		•	•	•		•	•	•	•	•	16,76,	000	
II. TOOLS AND PLANT	•	•	•	•		• :	•	•	•	•*	•	•	1,00,	000	
II. ESTABLISHMENT				•					•	•,	•.		2,80,	000	
							•		•						
Grand Total	•	•	•	•	•	•	•	•	•	•	•	•	20,56,	UUU	
					DET.	AIL	S								
. WORKS															
1. Dams and Appurten	ant Wo	orks-	-A. F	relin	inary l	Expe	nses								
Survey to be carried	out by	the	Surve	y of	India 1	Depti			•	•		•	•		2,00,00
Surveys to be carried	lout b	y or 1	under	dire	ctions o	of C.	w.r.n	.C.	L.S.						20,00
K. Buildings L. S.	•	•											•		25,00
2. Main canal and Bran															·
Misc. surveys as canal		nente	a. spe	cial r	eservoi	r sur	vevs e	tos							25,00
Soil surveys L. S.													•		45,000
3. Discharge and Silt C	)heerve	ations	. T. S	ι .		-	•		-			•	•	•	50,00
4. Meteorological survey				•	•	•	•	•	•	•	•	•	•	•	00,00
(a) Rain gauges—It is	propose	ed to	inste	I 30 1	new gar	iges (	i) Equ	ıip <b>m</b>	ent an	d insta	llatio	n of			
ganges 30 new rais	ท สุดเาอ	res in	ichidi	no t	emners	tura.	hnr	ridit:	z and	wind	velo	citv	•		
apparatus at 15 pl				elf re	cordin	g gav	ges a	an	averag	e rate	of 50	00/-	each		15,00
(ii) Observation expend					TO H			100							
1 Meteorological A			•	p.m.				*	•	•	•	•		400	
1 Senior observer		_		•	Y		10	•	•	•	•	•		440	
30 Part-time observ	ers at	Rs. 1	5 p.n	1.	1.6	131			•	•	•	•	•	<b>400</b>	
30 Part-time retaine	ers at l	Rs. 13	2 p.m	l.	4.3	31	n.X		•	•	•	•	4,	320	13,560
							11.17								28,560
(b) Seismological survey	ra T. S				門上面	i de		1							10,000
(o) persimological survey	, a D. D	•	•	•		2-2	in the latest		-	•	•	•	•	•	
					The same		topid in								38,560
				Se	y	1. 7				•	•	•			38,000
			·	d sur	veys et	c. L.	S		•		•				10,000
5. Geological Investiga	tions a	nd n	nneri												25,000
5. Geological Investiga 6. Communications L.		nd m	nuer:			•	•		•		•	•		•	20,000
6. Communications L.	8.	•	•	•	and ap	para	tus for	soil	labora	tory)	L.S.	•		•	
-	S. lant (D	•	•	•	and ap	para:	tus for	soil	labora	tory)	L.S.	•	•	•	12,00,00
<ol> <li>Communications L.</li> <li>Special Tools and Pl</li> <li>Economic surveys L</li> </ol>	S. lant (D . S.	rill e	quipi	nent	•	•	•	soil	labora	tory)	L.S.	•	•	•	12,00,000
6. Communications L. 1 7. Special Tools and Pl 8. Economic surveys L 9. Hydro-Electric Instal	S. lant (D . S. lations	rill e	quipi	nent	•	•	•	soil	labora	tory)	L.S.	•	•	•	12,00,000 3,00
6. Communications L. 1 7. Special Tools and Pl 8. Economic surveys L 9. Hydro-Electric Instal Electric Load survey	S. lant (D . S. llations ys L. S	rill e .—A.	quipr • • Prli	nent emin	ery ext	•	•	soil	labora	tory)	L.S.	•	•	•	12,00,000 3,00 2,00
6. Communications L. 1 7. Special Tools and Pl 8. Economic surveys L 9. Hydro-Electric Instal Electric Load survey	S. lant (D . S. lations	rill e .—A.	quipi Prli	nent emin	ary exp	ense	•	soil	labora	tory)	L.S.	•	•	•	12,00,000 3,00 2,00
6. Communications L. 1 7. Special Tools and Pl 8. Economic surveys L 9. Hydro-Electric Instal Electric Load survey	S. lant (D . S. llations ys L. S	rill e .—A.	quipi Prli	nent emin	ery ext	ense	•	soil	labora	tory)	L.S.	•			12,00,000 3,00 2,00 33,00
6. Communications L. 1 7. Special Tools and Pl 8. Economic surveys L 9. Hydro-Electric Instal Electric Load survey Conti	S. lant (D . S. llations ys L. S	rill e .—A.	quipi Prli 2 pe	nent emin	ary exp	ense	•	soil	labora	tory)	L.S.	•		:	12,00,000 3,00 2,00 33,00
6. Communications L. 1 7. Special Tools and Pl 8. Economic surveys L 9. Hydro-Electric Instal Electric Load survey Conti	S. lant (D . S. llations ys L. S ingenci	rill e .—A. es at	quipi Prli 2 pe	nent emin	ary exp	ense	•	soil	labora	tory)	L.S.	•			12,00,000 3,000
6. Communications L. 1 7. Special Tools and Pl 8. Economic surveys L 9. Hydro-Electric Instal Electric Load survey Conti	S. lant (D. S. llations ys L. S ingenci	rill e	quipi Prli 2 pe	nent emin	ary exp	ense	•	soil	labora	tory)	L.S.	•			12,00,000 3,00 2,00 33,00
6. Communications L. 1 7. Special Tools and Pl 8. Economic surveys L 9. Hydro-Electric Instal Electric Load survey Conti  I. TOOLS AND PLANT 3 country boats at Rs. 6 Chronographs at Rs.	S. lant (D S. liations lys L. S ingenci  1000 e	es at	quipr Prli	nent emin r cen Total	ary exp	ense	•	soil	labora	tory)	L.S	•		600	12,00,000 3,00 2,00 33,00
6. Communications L. 1 7. Special Tools and Pl 8. Economic surveys L 9. Hydro-Electric Instal Electric Load survey Conti  II. TOOLS AND PLANT 8 country boats at Rs. 6 Chronographs at Rs. 4 Levelling instrument	S. lant (D S. llations ys L. S ingenci  1000 e 100 ea s at Rs	es at	quipr Prli	nent emin r cen Total	ary exp	ense	•	soil	labora	tory)	L.S	•	3,	600 200	12,00,000 3,00 2,00 33,00
6. Communications L. 1 7. Special Tools and Pl 8. Economic surveys L 9. Hydro-Electric Instal Electric Load survey Conti  I. TOOLS AND PLANT 3 country boats at Rs. 6 Chronographs at Rs. 4 Levelling instrument 2 Theodolites at Rs. 1,8	S. lant (D S. llations llations 1000 e 100 ea s at Re	es at	quipr Prli	nent emin r cen Total	ary exp	ense	•	soil	labora	tory)	L.S	•	3, 3,	600 200 000	12,00,00 3,00 2,00 33,00
6. Communications L. 1 7. Special Tools and Pl 8. Economic surveys L 9. Hydro-Electric Instal Electric Load survey Conti  I. TOOLS AND PLANT 3 country boats at Rs. 6 Chronographs at Rs. 4 Levelling instrument 2 Theodolites at Rs. 1,6 2 Binoculars at Rs. 200	S. lant (D S. llations llations 1000 e 100 ea s at Re	es at	quipr Prli	nent emin r cen Total	ary exp	ense	•	soil	labora	tory)	L.S.	•	3, 3,	600 200 000 400	12,00,00 3,00 2,00 33,00
6. Communications L. 1 7. Special Tools and Pl 8. Economic surveys L 9. Hydro-Electric Instal Electric Load survey Conti  II. TOOLS AND PLANT 3 country boats at Rs. 6 Chronographs at Rs. 4 Levelling instrument 2 Theodolites at Rs. 1,6 2 Binoculars at Rs. 200 1 Camera at Rs. 600	S. lant (D. S. lations lations ys L. S ingenci  1000 e 100 ea s at Re 500 each	es at	quipr Prli 2 pe	nent emin r cen Total	ary exp	ense	•	soil	labora	tory)	L.S.	•	3, 3,	600 200 000 400 600	12,00,000 3,00 2,00 33,00
6. Communications L. 1 7. Special Tools and Pl 8. Economic surveys L 9. Hydro-Electric Install Electric Load survey Conti  II. TOOLS AND PLANT 3 country boats at Rs. 6 Chronographs at Rs. 4 Levelling instrument 2 Theodolites at Rs. 1,4 2 Binoculars at Rs. 200 1 Camera at Rs. 600 4 Measuring chains at 1	S. lant (D. S. lations ys L. S ingenci  1000 ea 100 ea s at Re 500 each . Rs. 15	each	quipr Prli 2 pe	nent emin r cen Total	ary exp	ense	•	soil	labora	tory)	L.S	•	3, 3,	600 200 000 400 600 60	12,00,000 3,000 2,00 33,000
6. Communications L. 1 7. Special Tools and Pl 8. Economic surveys L 9. Hydro-Electric Instal Electric Load survey Conti  II. TOOLS AND PLANT 3 country boats at Rs. 6 Chronographs at Rs. 4 Levelling instrument 2 Theodolites at Rs. 1,6 2 Binoculars at Rs. 200 1 Camera at Rs. 600 4 Measuring chains at 1 10—100 ft. tapes at Rs.	S. lant (D. S. lations ys L. Singenci 1000 eas at R. 500 each . Rs. 15. 30 each	each cach cach cach cach cach cach	quipr Prli 2 pe	nent emin r cen Total	ary exp	ense	•	soil	labora	tory)	L.S		3, 3,	600 200 000 400 600	12,00,000 3,00 2,00 33,00
6. Communications L. 1 7. Special Tools and Pl 8. Economic surveys L 9. Hydro-Electric Instal Electric Load survey Conti  II. TOOLS AND PLANT 3 country boats at Rs. 6 Chronographs at Rs. 4 Levelling instrument 2 Theodolites at Rs. 1,4 2 Binoculars at Rs. 200 1 Camera at Rs. 600 4 Measuring chains at 1	S. lant (D. S. lations ys L. Singenci 1000 eas at Rs 500 each . 30 each . 20 each . 20 each	each cach cach cach cach cach cach cach	quipr Prli 2 pe	nent emin r cen Total	ary exp	ense	•	soil	labora	tory)	L.S	•	3, 3,	600 200 000 400 600 60	12,00,000 3,00 2,00 33,00

Scales with offsets, french curves and Misc.	•	•									
Scientific instruments, tools and plant .	•			•		•				200	
4 current meter at Rs. 1,000 each							,		4,	000	
6 Large boats at Rs. 1,000 each									-	000	
6 Small boats at Rs. 500 each									3,	000	
Discharge rods									•	200	
Recurring laboratory equipment										200	
Ropes	•						Ċ			500	
7 Nos. $14' \times 14'$ tents at Rs. 1,200 each .								-	•	400	
20 Nos. 10' × 10' tents at Rs. 800 each .			-	-			-			000	
20 Shouldaries at Rs. 600 each					-			Ī	-	000	
20 Servants, tents at Rs. 600 each			_	Ĭ.	•	•	•			000	
Camp furniture		•		-	·	•	•		-	000	
Office furniture for Divl. and Sub-Divl. offices		•	·	·	·		·	·	12,0		
Office furniture for soil Physicist's office and I			•	•	•	·	•	•		000	
Office furniture for geologist's office	•	•	•	·	•	·	•	•		000	
(b) Repairs and Carriage-Yearly repairs to true		•	•	•	•	•	•	•		500	·
2 per cent contingencies .		•	•	•	•	• .	• .	•		000	
2 por conv couringoncies .	•	•	•	•	•	•	•	• –	۷,	700	
Total To	ra sloc	nd Pla	nt	•	•	•	•	•	99,	560	
									Say	7	1,00,000
											, , , , ,
III. ESTABLISHMENT	10 Tay	The A	A.								
Pay of Officers	4		15	3							
	為以音		100								
1 Executive Engineer for 12 months @ Rs. 9	Pre Contract	and the same of			•	•	,•	•	•	•	10,800
4 Assistant Engineers for 12 months @ Rs. 3	50 p.r	n.			•	•	• .	•	•	•	16,800
1 Geologist for 12 months @ Rs. 600 p.m.					•	•	•	•	,	•	7,200
2 Asstt. Geologists for 12 months @ Rs. 400	p.m.		4.0		•	•	•	•	•	•	9,600
1 Soil Physicist at Rs. 275 p.m	اريان		1/4		•	•	•	•	•	•	3,300
		Total								*	47,700
	1			1							•
Pay of establishment											
16 Overseers for 12 months @ Rs. 180 p.m.	110	444			•			•	•		84,560
1 Head clerk for 12 months @ Rs. 160 p.m.						•		•	•	•	1,920
1 Accountant for 12 months @ Rs. 200 p.m.	•			•	•	•	•		•	•	2,400
1 Sub-Asett. Surgeon for 12 months @ Rs. 20	)0 p.n	٠. ،					•	•	•	•	2,400
5 Clerks for 12 months at Rs. 80 p.m.	•					•			•		4,800
8 Sub-Divl. clerks for 12 months @ Rs. 75 p.	m.				•	•				•	7,200
1 Head Draftsman for 12 months @ Rs. 250	p.m.					•					3,000
1 Junior Draftsman for 12 months @ Rs. 100	- ) р.т.										1,200
2 Tracers for 12 months @ Rs. 80 p.m.	٠.									•	1,920
1 Dispenser for 12 months @ Rs. 80 p.m.											960
1 Daffadar for 12 months @ Rs. 35 p.m											420
5 Barkandazes for 12 months @ Rs. 30 p.m.				•	•				•	•	1,800
11 Peons for 12 months @ Rs. 30 p.m.	-		,	•	•	•	•	•	•	•	3,960
6 Peons for 12 months for officers @ Rs. 30 p	1.m.	•	•	•	•	•	•	•	•	•	2,160
5 Chowkidars for 12 months @ Rs. 30 p.m.	,,,,,,,,,		•	•	•	•	•	•	•	•	
6 Dak runners for 12 months @ Rs. 30 p.m.	•	•	•	•	•	•	•	•	•	•	1,800 2,160
16 Khalasis for overseers for 12 months @ Rs.	30 ~	m ·	•	•	•	•	•	•	•	•	
		144+	•	•	•	•	•	•	•	•	5,760
10 Gauge readers for 12 months @ Rs. 30 p.m Geologist's staff L. S	•	•	•	•	•	• •	•	•	•	•	3,600
9	•	•	•	•	•	•	•	•	•	•	7,400
6 Sub-Overseers for 12 months at Rs. 50 p.m	• •	•	•	•	•	•	,	•	•	•	3,600

3 Laboratory Asstts. for 12 months	@ Rs. 100 p.m.		•	•	•		٠		3,600
2 Clerks for 12 months @ Rs. 40 p.	m		•	•			•	•	960
1 Computer for 12 months @ Rs. 4	0 p.m				•				480
1 Tracer for 12 months @ Rs. 40 p.	-		•			•			480
3 Laboratory peons for 12 months		•. •		• .					900
2 Peons for 12 months @ Rs. 25 p.	-								600
1 Tapali for 12 months @ Rs. 25 p.									300
4 Auger measurers for 12 months @				•		• ,	• .		1,920
	Total .								1,02,260
Dearness allowance and Special pay	of Officers L. S.								12,235
Dearness allowance of establishmen				•	•	•			49,000
Travelling Allowance of officers									
Executive Engineers .								3,200	
Assistant Engineers	• • •	• •	•	•	•	•	•	6,200	
Geologist			•	•	•	•	•	7,200	
Asstt. Geologists			•	•	•	•	•	9,000	
Soil Physicist	• • •	• •	·	•		:		5,250	30,850
Travelling allowance of establishme	nt.						-	-	•
Supervisors								14.800	
Other staff—XEN'S							•	6,400	
Geologist other staff	1							2,300	
Soil survey staff	42/19	13.515	2			- •	_	•	
Sub overseers	(2.1/3)		550					1.900	
Auger measurers.				•	•	•	•	1,900	
Other staff	837	1000		•	•	•	•	2,155	29,455
	400		7 .	•	•	•	·-	<del></del>	20,***
Establishment contingencies	4.8								
Rent for Divl. and Sub-Divl. offices				•	•	•	•		4,000
Rent for soil physicist's office and l	aboratory	Total Total			•	•			1,500
Rent for geologist's office.	1	in Oarly	E.		•	•	•		3,000
	1.4	Maria California							8,500
	Total Establis	shment	7		•				2,80,000

IV. ESTIMATE FOR PRELIMINARY SURVEYS AND INVESTIGATIONS IN CONNECTION WITH PROJECTS FOR THE MULTI-PURPOSE DEVELOPMENT OF THE TAPTI BASIN, PREPARED IN ACCORDANCE WITH THE INSTRUCTIONS OF THE ad hoc COMMITTEE.

#### ABSTRACT

I. WORKS													
													D
1. Dams and appurtenant Works													Rs.
A. Preliminary Expenses .	•	•	•	•	•	•	•	•	•	•	•	•	3,19,525
K. Buildings	•	•	•	•	•	•	•	•	•	•	•	•	40,000
2. Main Canals and Branches .	•	•	•	•	•	•	•	•	•	•	•	•	4,36,750
3 Discharge and Silt observations		•	•	•	•	•	•	•	•	•	•	•	. 70,000
4. Meteorological observations	•	•	•	•	•	•	•	•	•	•	•	•	13,600
5. Mineral survoys	•	•	•	•	•	•	•	•	•	•		•	5,000
<ol><li>Surveys for Pisciculture</li></ol>	•	•	•	•	•	•	,	•	•	•	•	•	1,000
7. Malaria survey	•	•	•	•	•	•	٠	٠	•	•	. •	•	2,500
8. Electric Load Surveys	•	•	•	•	•		•	•	•	•	-	•	4,000
9. Surveys for Navigation .	• '	•	•	•	•	٠.	•		•	•			40,000
10. Economic and Property surveys			•		•	•	•				-		15,000
11. Surveys for soil orosion .	•		•				•						4,000
12. Communications				•		•	•						90,000
13. Special Tools and Plant .												. 1	1,70,000
•			-	150				<u> </u>					10 11 075
		9	12	134	2		2 n	orce	nt' co	ntinge	ancies		12,11,375 $24,227$
		536	H.	2	£3,		2 1	0. 00	110,100		MOTOD	٠.	
									•				12,35,602
II. TOOLS AND PLANT	•	. 12	Elv:		•	•	•	•	•	•	•	•	1,87,680
III. ESTABLISHMENT	•	- 188		10	W.	•	•	•	•	•	•	٠.	5,72,232
		1	1	2.57					Gran	d Tota	al		19,95,514
		7	21.3	14				•		0- 8		-	19,95,500
			413	Pak.	45			•	•	Or Say	y	٠.	10,00,000
		D.	ETA	ILS									
I. WORKS		Tier.	ALC: N	2									
1. Dams and appurtenant works		-											
		-	27112	35	a								
A. Preliminary Expenses		1, 1	7 F 10	100 540									
	A:					and a	11807077	han	mlatti.		towa	n+	$\mathbf{Rs.}$
1. Survey of the Reservoir Basin by	Air ; f 4"=	photo	graph	iy an	d gro	und s of Uk	urvey ai/Tok	and arwa	plottir Dam	ng con at Rs	ntours	at er	Rs.
	Air ) f 4"=	photo	graph	iy an	d gro	und s of Uk	urvey ai/Tok	and arwa	plottir Dam	ng con at Rs	ntours 1. 375 p	at er	Rs.
1. Survey of the Reservoir Basin by 10 ft.—5ft. intervals on a scale of	f 4"=	photo l mil	graph le 275	y an sq. 1	d gro niles	of Uk	ai/Tok	arwa	Dam	at Rs	. 375 p	at er	
1. Survey of the Reservoir Basin by 10 ft.—5ft. intervals on a scale of sq. mile	f 4"=	photo l mil	graph le 275	y an sq. 1	d gro niles	of Uk	ai/Tok	arwa	Dam	at Rs	. 375 p	at er	
<ol> <li>Survey of the Reservoir Basin by 10 ft.—5ft. intervals on a scale of sq. mile</li> <li>Survey of dam and weir site by air</li> </ol>	f 4"=	photo l mil	graph le 275	y an sq. 1	d gro niles	of Uk	ai/Tok	arwa plott	Dam	at Rs	. 375 p	at er	
<ol> <li>Survey of the Reservoir Basin by 10 ft.—5ft. intervals on a scale of sq. mile</li> <li>Survey of dam and weir site by air</li> </ol>	f 4"=	photo l mil	graph le 275	y an sq. 1	d gro niles	of Uk	ai/Tok · y and	arwa plott es	Dam	at Rs	. 375 p	at er	
<ol> <li>Survey of the Reservoir Basin by 10 ft.—5ft. intervals on a scale of sq. mile</li> <li>Survey of dam and weir site by air 32"=1 mile</li> </ol>	f 4"=	photo l mil	graph le 275	y an sq. 1	d gro niles	of Uk	ai/Tok y and acr 3,00	arwa plott es	Dam	at Rs	. 375 p	at er •	
<ol> <li>Survey of the Reservoir Basin by 10 ft.—5ft. intervals on a scale of sq. mile</li> <li>Survey of dam and weir site by air 32"=1 mile</li> <li>Ukai/Tokarwa dam site</li> </ol>	f 4"=	photo l mil	graph le 275	y an sq. 1	d gro niles	of Uk	ai/Tok y and aer 3,00	plottes	Dam	at Rs	. 375 p	at er •	
<ol> <li>Survey of the Reservoir Basin by 10 ft.—5ft. intervals on a scale of sq. mile</li> <li>Survey of dam and weir site by air 32"=1 mile</li> <li>Ukai/Tokarwa dam site</li> </ol>	f 4"=	photo l mil	graph le 275	y an sq. 1	d gro niles	of Uk	ai/Tok y and acr 3,00	plottes	Dam	at Rs	. 375 p	at er	
<ol> <li>Survey of the Reservoir Basin by 10 ft.—5ft. intervals on a scale of sq. mile</li> <li>Survey of dam and weir site by air 32"=1 mile</li> <li>Ukai/Tokarwa dam site</li> </ol>	f 4"=	photo l mil	graph le 275	y an sq. 1	d gro niles	of Uk	ai/Tok y and aer 3,00	plottes	Dam	at Rs	. 375 p	at er	
1. Survey of the Reservoir Basin by 10 ft.—5ft. intervals on a scale of sq. mile  2. Survey of dam and weir site by air 32"=1 mile  Ukai/Tokarwa dam site  Kakarpar weir site  3,600 acres at Rs. 4 per acre  3. Geological investigations for found	f 4"=	photo I mil tograp	graph e 275 chy a	y an sq. r	d gro	of Uk surve	ai/Tok y and aer 3,00 60 3,60	plotters	Dam . ting or	at Rs	. 375 p	·	1,03,125
<ol> <li>Survey of the Reservoir Basin by 10 ft.—5ft. intervals on a scale of sq. mile</li></ol>	f 4"=	photo I mil tograp	graph e 275 chy a	y an sq. r	d gro	of Uk surve	ai/Tok y and aer 3,00 60 3,60	plotters	Dam . ting or	at Rs	. 375 p	·	1,03,125
1. Survey of the Reservoir Basin by 10 ft.—5ft. intervals on a scale of sq. mile  2. Survey of dam and weir site by air 32"=1 mile  Ukai/Tokarwa dam site Kakarpar weir site  3,600 acres at Rs. 4 per acre  3. Geological investigations for found	f 4"=	photo I mil tograp	graph e 275 chy a	y an sq. r	d gro	of Uk surve	ai/Tok y and aer 3,00 60 3,60	plotters  plotte	Dam . ting or	at Rs	. 375 p	·	1,03,125
1. Survey of the Reservoir Basin by 10 ft.—5ft. intervals on a scale of sq. mile  2. Survey of dam and weir site by air 32"=1 mile  Ukai/Tokarwa dam site  Kakarpar weir site  3,600 acres at Rs. 4 per acre  3. Geological investigations for found	f 4"=	photo I mil tograp	graph e 275 chy a	y an sq. r	d gro	of Uk surve	ai/Tok y and aer 3,00 60 3,60 e and testing	plotters  plotte	Dam . ting or	at Rs	. 375 p	·	1,03,125
<ol> <li>Survey of the Reservoir Basin by 10 ft.—5ft. intervals on a scale of sq. mile</li> <li>Survey of dam and weir site by air 32"=1 mile</li> <li>Ukai/Tokarwa dam site</li></ol>	f 4"=	photo I mil tograp	graph e 275 chy a	y an sq. r	d gro	of Uk surve	ai/Tok y and aer 3,00 60 3,60 e and testing	plotters of the grant of the gr	Dam . ting or	at Rs	. 375 p	·	1,03,125
1. Survey of the Reservoir Basin by 10 ft.—5ft. intervals on a scale of sq. mile  2. Survey of dam and weir site by air 32"=1 mile  Ukai/Tokarwa dam site  Kakarpar weir site  3,600 acres at Rs. 4 per acre  3. Geological investigations for found boring, core drilling, making drift  Kakarpar weir  Ukai/Tokarwa dam	f 4"= r phot	photo I mil tograp	graphe 275  chy a	sq. r sq. r ind gr	d gro	of Uk surve	ai/Tok y and acr 3,00 60 3,60 e and testin	plotters of the grant of the gr	Dam . ting or	at Rs	. 375 p	·	1,03,125
<ol> <li>Survey of the Reservoir Basin by 10 ft.—5ft. intervals on a scale of sq. mile</li> <li>Survey of dam and weir site by air 32"=1 mile</li> <li>Ukai/Tokarwa dam site</li> <li>Kakarpar weir site</li> <li>Geological investigations for found boring, core drilling, making drift</li> <li>Kakarpar weir</li> <li>Ukai/Tokarwa dam</li> <li>Ukai/Tokarwa dam</li> <li>182 Nos. each of 50 R. ft.—9,100</li> </ol>	f 4"= r phot	photo I mil tograp s of o	graph e 275	y any any sq. 1	d gro	of Uk surve	ai/Tok y and acr 3,00 60 3,60 e and testin	plotters of the grant of the gr	Dam . ting or	at Rs	. 375 p	by	1,03,125 14,400 1,82,000
<ol> <li>Survey of the Reservoir Basin by 10 ft.—5ft. intervals on a scale of sq. mile</li> <li>Survey of dam and weir site by air 32"=1 mile</li> <li>Ukai/Tokarwa dam site</li> <li>Kakarpar weir site</li> <li>Geological investigations for found boring, core drilling, making drift</li> <li>Kakarpar weir</li> <li>Ukai/Tokarwa dam</li> <li>Soil Analysis and burrow surveys in</li> </ol>	f 4"= r phot lation ts and	photo I mil tograp	graph e 275 obly a dam s dam s ea. 20	y any any sq. r	d groniles	of Uk surve	ai/Tok y and acr 3,00 60 3,60 e and testin	plotters of the grant of the gr	Dam . ting or	at Rs	. 375 p	. by	1,03,125 14,400 1,82,000 10,000
<ol> <li>Survey of the Reservoir Basin by 10 ft.—5ft. intervals on a scale of sq. mile</li> <li>Survey of dam and weir site by air 32"=1 mile</li> <li>Ukai/Tokarwa dam site</li> <li>Kakarpar weir site</li> <li>Geological investigations for found boring, core drilling, making drift</li> <li>Kakarpar weir</li> <li>Ukai/Tokarwa dam</li> <li>Ukai/Tokarwa dam</li> <li>182 Nos. each of 50 R. ft.—9,100</li> </ol>	f 4"= r phot lation ts and	photo I mil tograp	graph e 275 obly a dam s dam s ea. 20	y any any sq. r	d groniles	of Uk surve	ai/Tok y and acr 3,00 60 3,60 e and testin	plotters of the grant of the gr	Dam . ting or	at Rs	. 375 p	. by	1,03,125 14,400 1,82,000 10,000
<ol> <li>Survey of the Reservoir Basin by 10 ft.—5ft. intervals on a scale of sq. mile</li> <li>Survey of dam and weir site by air 32"=1 mile</li> <li>Ukai/Tokarwa dam site</li></ol>	f 4"= r phot lation ts and	photo I mil tograp	graph e 275 obly a dam s dam s ea. 20	y any any sq. r	d groniles	of Uk surve	ai/Tok y and acr 3,00 60 3,60 e and testin	plotters of the grant of the gr	Dam . ting or	at Rs	. 375 p	by	1,03,125 14,400 1,82,000 10,000

	inded a	rea fo	r can	al alig	nment	7,00.0	00 ac	res a	t 0-9•	0 per	acre.			3,93,75
(b) Miscellaneous surveys						•				٠.			. L.S.	6,00
(c) Exploration for the for	undatio	ons of	CTO88	-drain	age wo	rks an	d nec	essar	y sur	veys			. L.S.	30,
(d) Soil surveys 7,00,000 s										٠.				7,00
III. Discharge and Silt observa (Period 2 years)														4,36,7500
One boatman and four kha • samplers and laborate	ry equ	t each ipmen	disch it 7 si	tes at	ite, co Rs. 5,	et of re	pes, r site	per y	arge :	rods,	ficate	gau	ges, si	70,00
IV. Meteorological observation	ເອ													
Rain gauges, temperature,	humid	li $f ty$ as	ad wir	ad velo	city o	bserva	tions	1						
Equipment and installation type) and humidity as	nd win	d velo	city a	ppara	tus at	5 stati	ons,	at an	aver	ge re	te of			10,00
Recurring expenditure on p	part-tir	ne ob	servat	tions l	0 obse	r <b>ver</b> s e	t Rs	. 15 p	.m. f	or 2 3	/eare		•	3,60
														13,60
														Rs.
V. Mineral surveys .	•	•		•	•	•		٠	•		•	•	L.S.	5,00
VI. Surveys for Pisciculture .	•			•	•	.*	•				•	•	L.S.	1,00
VII. Malaria survey	•	•		•	3-73 -			•	•	•	•	•	L.8.	2,50
III. Electric load survey .	•	•	• 10	7.13		and a	•	•	•	•	•	•	L.S.	4,00
IX. Survey for Navigation .	• •	•					•	•	•		•	•	L.S.	40,00
X. Economic and Property sur	veys	•	1400					•	•	•	•	•	L.S.	15,00
XI. Surveys for soil erosion .	•	•	· 8			971	•	•	•	•	•	•	L.S.	4,00
TIT Communications			10		A 100									
XII. Communications Constructing 30 miles of ter	nporar	y roac	is and	l their	maint	enance	o for	2 ува	rs at	Rs. 3	,000 p	er m	ile .	90,000
Constructing 30 miles of ter	nporar	у гово	ds and	i their	maint	enance	o for	2 уев	rs at	Rs. 3	,000 p	er m	ile .	90,000
Constructing 30 miles of ter	_		-			1		2 yee.	rs at	Rs. 3	,000 p	er m	ile .	
Constructing 30 miles of ter III. Special Tools and Plant 1. 2 Diamond Drills comple 2. Testing apparatus and h	te with	acce	esorie	s at R	60,0 equit	00 esc	h. for c	• ompr	BEBIVE	stren		•	ksand	1,20,000
Constructing 30 miles of ter III. Special Tools and Plant 1. 2 Diamond Drills comple	te with	acce	esorie d woi imum	s at R rkshor moist	s. 60,0 equipure co	00 each	h. for c	• ompr	BEBIVE	stren		•	ksand	1,20,000 l . S. 50,00
Constructing 30 miles of ter III. Special Tools and Plant 1. 2 Diamond Drills comple 2. Testing apparatus and h	te with	acce	esorie d woi imum	s at R	s. 60,0 equipure co	00 each	h. for c	• ompr	BEBIVE	stren		•	ksand	1,20,000 l. S. 50,00 1,70,000
Constructing 30 miles of ter III. Special Tools and Plant 1. 2 Diamond Drills comple 2. Testing apparatus and h	te with	acce	esorie d woi imum	s at Rickshor moist	s. 60,0 equipure co	00 each	h. for c	• ompr	BEBIVE	stren		•	ksand	1,20,000 1. S. 50,00 1,70,000
Constructing 30 miles of ter III. Special Tools and Plant 1. 2 Diamond Drills comple 2. Testing apparatus and h	te with	acce	esorie d woi imum	s at Rickshor moist	s. 60,0 equipure co	00 each	h. for c	• ompr	BEBIVE	stren		•	ksand	1,20,000 1. S. 50,00 1,70,000
Constructing 30 miles of ter III. Special Tools and Plant 1. 2 Diamond Drills comple 2. Testing apparatus and leasting soils for shear s	te with	acce	esorie d woi imum	s at Rickshor moist	s. 60,0 equipure co	00 each	h. for c	• ompr	BEBIVE	stren		•	ks and	1,20,000 1,5,50,00 1,70,000 12,11,375 24,22
Constructing 30 miles of ter  III. Special Tools and Plant  1. 2 Diamond Drills comple 2. Testing apparatus and leasting soils for shear s  2 per cent contingencies  II. TOOLS AND PLANT	aborate	a acce	esories ad wos imum	s at R rkshop moist	a. 60,0 equipure co	00 each	h. for con	• ompr	BEBIVE	stren		•	ks and	1,20,000 1. S. 50,00 1,70,000 12,11,375 24,227 12,35,602
Constructing 30 miles of ter  III. Special Tools and Plant  1. 2 Diamond Drills comple 2. Testing apparatus and leasting soils for shear s  2 per cent contingencies  II. TOOLS AND PLANT  1. Motor vehicles for survey	te with aborate trength	a acce	esories ad wos imum	s at R rkshop moist	a. 60,0 equipure co	00 each	h. for con	• ompr	BEBIVE	stren		•	ks and	1,20,000 1,70,000 1,70,000 12,11,378 24,227 12,35,602
Constructing 30 miles of ter  III. Special Tools and Plant  1. 2 Diamond Drills comple 2. Testing apparatus and leasting soils for shear s  2 per cent contingencies  II. TOOLS AND PLANT  1. Motor vehicles for survey  Working expenses for 2	te with aborate trength	a acce	esories ad wos imum	s at R rkshop moist	a. 60,0 equipure co	00 each	h. for con	• ompr	BEBIVE	stren		•	ks and	1,20,000 1,70,000 1,70,000 12,11,375 24,227 12,35,602 49,000 35,000
Constructing 30 miles of ter  III. Special Tools and Plant  1. 2 Diamond Drills comple 2. Testing apparatus and leasting soils for shear s  2 per cent contingencies  II. TOOLS AND PLANT  1. Motor vehicles for survey Working expenses for 2  2. Scientific Instruments	te with aborate trength	a acce	esories ad wos imum	s at R rkshop moist	a. 60,0 equipure co	00 each	h. for con	• ompr	BEBIVE	stren		•	ks and	1,20,000 1,70,000 1,70,000 12,11,375 24,227 12,35,602 49,000 35,000 60,000
Constructing 30 miles of ter  III. Special Tools and Plant  1. 2 Diamond Drills comple 2. Testing apparatus and leasting soils for shear s  2 per cent contingencies  II. TOOLS AND PLANT  1. Motor vehicles for survey Working expenses for 2  2. Scientific Instruments  3. Ordinary tools and plant	te with aborate trength	a acce	esories ad wos imum	s at R rkshop moist	a. 60,0 equipure co	00 each	h. for con	• ompr	BEBIVE	stren		•	ks and	1,20,000 1,70,000 1,70,000 12,11,375 24,227 12,35,602 49,000 35,000 60,000 5,000
Constructing 30 miles of ter  III. Special Tools and Plant  1. 2 Diamond Drills comple 2. Testing apparatus and leasting soils for shear s  2 per cent contingencies  II. TOOLS AND PLANT  1. Motor vehicles for survey Working expenses for 2  2. Scientific Instruments	te with aborate trength	a acce	esories ad wos imum	s at R rkshop moist	a. 60,0 equipure co	00 each	h. for con	• ompr	BEBIVE	stren		•	ks and	1,20,000 1,70,000 1,70,000 12,11,378 24,22 12,35,602 49,000 60,000 5,000 15,000
111. Special Tools and Plant  1. 2 Diamond Drills comple 2. Testing apparatus and leasting soils for shear s  2 per cent contingencies  11. TOOLS AND PLANT  1. Motor vehicles for survey Working expenses for 2  2. Scientific Instruments  3. Ordinary tools and plant  4. Camp equipag	te with aborate trength	a acce	esories ad wos imum	s at R rkshop moist	a. 60,0 equipure co	00 each	h. for con	• ompr	BEBIVE	stren		•	ks and	1,20,000 1,70,000 1,70,000 12,11,375 24,227 12,35,602 49,000 35,000 60,000 5,000
Constructing 30 miles of ter CIII. Special Tools and Plant 1. 2 Diamond Drills comple 2. Testing apparatus and leasting soils for shear s  2 per cent contingencies  II. TOOLS AND PLANT 1. Motor vehicles for survey Working expenses for 2 2. Scientific Instruments 3. Ordinary tools and plant 4. Camp equipag	te with aborate trength	a acce	esories ad wos imum	s at R rkshop moist	a. 60,0 equipure co	00 each	h. for con	• ompr	BEBIVE	stren		•	ks and	1,70,000 1,70,000 12,11,375 24,227 12,35,602 49,000 35,000 60,000 5,000 15,000 20,000

III. ESTABLISHMENT												Expenditure
1. Pay of officers												per yoar.
I Executive Engineer at Rs. 875 p.m.												Rs.
2 Aestt. Executive Engineers at Rs. 600	D.70		•	•	•	•	•	•	•	•	•	10,500
2 Asstt. Engineers at Rs. 560 p.m.		•	•	•	•	•	•	•	•	•		14,400
1 Geologist at Rs. 875 p.m.	Ť.	·	•	•	•	•	•	•	•	•	•	13,440
2 Asstt. Geologists at Rs. 500 p.m.	•	•	•	•	•	•	•	•	•	•	•	10,500
1 Drill Foreman at Rs. 1,000			•		•	•	•	•	•	•		12,000
	•	•	•	•	•	•	•	•	•	•	•	72,840
2. Pay of Establishment												
1 Meteorological Asstt. at Rs. 240 p.m.												5.000
1 Accountant at Rs. 200 p.m	•	•	•	•	••	•	•	•	•	•	•	2,880
1 Head Clerk at Rs. 180 p.m.	•	•	•	•	•	•	•	•	•	•	•	2,400
3 Senior Clerks at Rs. 150 p.m.	•	•	•	•	•	•	•	•	•	•	•	2,160
1 Storekeeper at Rs. 150 p.m.	•	•	•	•	•	•	•	•	•	•	•	5,400
1 Senior Draftsman at Rs. 200 p.m.	•	•	•	•	•	•	•	•	•		•	1,800
7 Junior Clerks at Rs. 93 p.m.	•	•	•	•	•	•	•	•	•	•	•	2,400
I Junior Draftsman at Rs. 143 p.m.	•	•	•	•	•	•	•	•	٠	•		7,812
2 Tracers at Rs. 104 p.m.	•	•	•	•	•	•	•	•	•	•		1,716
1 Sub-Asstt. Surgeon at Rs. 170 p.m.	•	•	•	•		•	•	• •	•	•	•	2,496
1 Compounder at Rs. 50 p.m	•	•	•	•	•	•	•	•	•	•	٠	2,040
16 Overseers at Rs. 240 p.m.	٠	•	CO.	Di.	•	•	•	•	٠	•	٠	308
3 Research Assetts, at Rs. 240 p.m.	•	Ch		Call	-	•	٠	•	٠	•	•	46,080
1 Laboratory Asstt. at Rs. 230	. 4				10	•	•	•	•	•	•	8,640
1 Silt Analyst at Rs. 200	•		17		Tr.	٠	•	•	•	•	•	2,760
•	•				•	•	•	•	•	•	٠	2,400
1 Asstt. Silt Analyst at Rs. 93 5 Gauge Readers at Rs. 70	•	400		THE P		•	•	•	•	•	•	1,116
5 Senior observers at Rs. 90	•						•	•	•	•	•	4,200
	•	11			•	•	•	•	•	•	•	5,400
1 Dafadar at Rs. 33	•					•			•	•		396
5 Barkandazes at Rs. 33	•	1		172	1			•	•		•	1,980
7 Peons at Re. 33	•		11		<i>f</i>	•		•				2,772
3 Laboratory Khalasis at Rs. 33	•			•						•	•	1,188
5 Chowkidars at Rs. 33	•		169	517				•	•	•	•	1,980
		•										1,10,616
3. Dearness allowance for officers												
4. Dearness allowance for establishment	•	•	٠	•	•	•	•	•	•	•	•	19,720
5. Travelling allowance for officers	•	•	٠	•	٠	•	•	•	•	•	•	32,940
	•	•	•	•	•	•	•	•	•	•	•	20,000
6. Travelling allowance for establishment 7. Cost of Praince Circle office debitable to T	•	•	٠	•	•	•	•	•	•	•	•	13,000
7. Cost of Project Circle office debitable to T	apți	1	•	•		•	•	•	•	•	•	17,000
8. Establishment contingencies .	•	•	•	•	•	•	•	•	•	•	٠	10,000
Establishment per year	•	•		•	•	•	•	•	•	•	•	2,86,116
Total Establishm	ent	for 2 y	eara	•	•	•	•	•		•	•	5,72,232

G. N. PANDIT,

Project Officer;

(Narbada & Tapti).

#### APPENDIX VI.

#### SABARMATI PROJECT REPORT

#### (I) The Sabarmati River

The Sabarmati river drains a catchment area of 1,723 square miles before entering the Dharoi Gorge. The catchment area above Ahmedabad is about 5,000 square miles. The maximum discharge of the river at Dharoi is about 3,00,000 cusecs, while at Ahmedabad it may be taken to be about 5,00,000 cusecs.

Two important tributaries, the Hathmati (hill catchment about 237 square miles) and the Khari (hill catchment about 100 square miles) meet the Sabarmati between Dharoi and Ahmedabad. Below Ahmedabad, the main stream of the Meshwa System consisting of Meshwa (hill catchment about 316 square miles), Migham (hill catchment about 157 square miles) and Vatrak (hill catchment about 450 square miles) joins the river.

The river is a source of considerable danger to the industrial town of Ahmedabad and villages lower down. Monsoon floods in the past have caused devastation, destroyed crops, carried away cattle, changed course of delta channels and filled up harbours with silt.

#### (II) Works and Proposals in the Past

In the past some very small dams and anicuts for storage and irrigation have been constructed on the tributaries of the river. No large works have been undertaken although proposals to harness the main channel of the Sabarmati river have been under contemplation as far back as the second half of the nine-teenth century. A scheme was drawn up in 1904 by Bombay Engineers to construct a dam at Dharoi and three pick-up weirs at different places down the river up to Ahmedabad. The scheme was, however, dropped as it was not considered at the time sufficiently remunerative. Nothing tangible was done till 1935, when the Baroda Engineers started investigations and by 1942 produced a scheme, the details of which are available in two volumes. As the project could not proceed without the agreement of the several States having riparian rights and other interests in the waters of Sabarmati, the Baroda State referred it to the Bombay Government, who in turn sought the opinion of the Government of India. In addition, the Baroda Government wanted their project to be 'vetted' by the Central Waterways, Irrigation and Navigation Commission, and for that purpose a party of Engineers of the CWINC, headed by the Member for Irrigation, visited the area by air and land routes, and discussed the scheme with various interests informally and in conferences. All interests showed keenness to participate in a unified multipurpose development of the Sabarmati basin and not in piecemeal schemes and also wanted that the preparation of such a project be undertaken by the CWINC and that a special Division be opened under it for this purpose.

#### (III) Proposals

To implement the decisions arrived at in the conferences referred to in paragraph  $\Pi$ , available data has been studied and proposals are drawn up for opening a Division to complete investigations for drawing up a scheme for unified multipurpose development of the entire Sabarmati basin.

A statement showing the rough details of the dam sites and possible irrigation areas is enclosed. The main work lies on the Sabarmati river itself, as there are possibilities for a dam at Dharoi, where the main stream debouches in the plains. The storage capacity of the reservoir formed by a dam of about 150 feet height at this site may be as much as 30,000 m.c. ft., which is expected in normal years to equal almost all the run-off from the catchment up to this point. The regulated discharge will be of the order of 500 cusecs yielding about 3,000 to 4,000 kW. of firm power, ensuring about 100 cusecs of constant flow for Ahmedabad water supply and making possible irrigation to the extent of about 1,00,000 acres with or without the help of pick-up weirs between Dharoi and Ahmedabad. Detailed investigations are necessary to find the exact location of the sites for pick-up weirs, the alignments for canals and location of the areas to be irrigated.

From a study of the form line sheets, possible sites for a dam on the Hathmati, a dam on Ghuvai, a pick-up weir on the Hathmati for the above two dams, a dam and pick-up weir on Meshwa, a dam on Vatrak and a dam on Majham (the main tributaries of the Sabarmati system) have been located very approximately and marked on the index map. The discharge available due to storage at these dams is likely to irrigate another 1,00,000 acres making a total of 2,00,000 acres irrigation over the entire basin. Taking an intensity of 40% the culturable commanded area should be about 5,00,000 acres. Possible location of the areas making up this figure are shown on the enclosed index map.

#### (IV) Estimate

An estimate is enclosed. Worked out in great detail, it provides for manning a Division with three Sub-Divisions for two years to complete the necessary investigations and to draw up a complete project for the unified multipurpose development of the entire Sabarmati basin.

The estimate amounts to Rs. 15,10,000. surveys of the reservoir and irrigation areas costing about Rs. 5,86,000 are proposed to be carried out through the Survey of India. All other investigations like the surveys for dam sites, canal alignment, soil surveys, discharge and silt obeservations and property surveys are proposed to be carried out independently by the CWINC. Geological surveys including core drilling are proposed to be carried out with the help of resident geologists and under the general advice of the Geological Survey of India. Meteorological surveys including fixing of new rain gauges and observatories for recording temperatures, humidity, wind velocity, etc. will be planned and carried out by the CWINC, under the guidance of the Meteorological Department.

Necessary provision has been made in the estimate for temporary buildings to accommodate the staff, for communications, for electric load surveys and for laboratory apparatus, etc. Necessary provision has also been made for the purchase of office equipment, scientific and ordinary tools and plant, and motor vehicles for transport in the difficult area.

M. D. MITHAL,

Director, Irrigation and Waterways,

C. W. I. N. C.



# STATEMENT SHOWING PROPOSED DAM SITES AND POSSIBLE IRRIGATION AREA ON SABARMATI AND ITS TARIBUTARIES

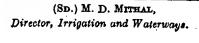
Name of river or tributary	Site and Location	Dam or pick-up weir	Catchment area in sq. miles	Possible average annual runoff in million cu. ft.	Possible annual irrigation in acres	Area to be surveyed in acres for irrigation	Remarks
Sabarmati	Dharoi	Dam	1,723	15,000	• •		
	Valsana	Pick-up weir .	4.4		60,000	150,000	
	Waghpur . 72° 47′ E., 23° 28′ N.	Do	~	••	<b>4</b> 0,000	100,000	
	Ahmedabad . 72° 36′ E., 23° 2′ N.	Do		<b>.,</b> ·			100 cusecs with the reserve for Ahmede bad water supply.
Meshwa	Near Lachhai . 73° 10' E., 23° 30' N.	Dam .		3			
Meshwa	Near Warwara.	Pick-up weir .	316	2,800	28,000	70,000	
	73° 5′ E., 23° 30′ N.					·	
Hathmati	Near Fatepur . 73° 10' E., 23° 40' N.	Dam	237	2,000	20,000	50,000	
Ghuvai	Near Khandial. 73° 5' E., 23° 40' N.	Dam .	ा नधने				
Hathmati	Near Himmat . Nagar. 72° 58' E., 23° 36' N.	Pick-up weir .	192	1,600	16,000	40,000	
Vatrak	Near Bhanipura 73° 22' E., 23° 20' N.	Dam	<b>4</b> 50	3,900	39,000	97,000	
Majham	Near Munsi- wara. 73° 22' E., 23° 17' N.	Dam	157	1,300	13,000	34,000	
		Total .	3,075	26,600	216,000	541,000 acres say 850 sq. milés.	

N. B.—Above the Dharoi dam site, there appear to be some sites for dams as indicated on the plan. These will need to be verified for the sake of negotiations amongst the various interests. The ultimate aim is, however, to concentrate on the Dharoi dam site.

# Overall Estimate for Preliminary Surveys and Investigations for Possible Multipurpose Development of Sabarmati Basin

#### Abstract

Serial No.					Ite	em.			-		<del></del>			Estimated amount
														Rs.
1.	Survey through the Survey	of Ind	ia Staff	unde	r the	direc	ion of	f the	c. w.	I. N.	C. `.			5,86,500
2.	Other river and land survey	s to be	carrie	l out	by th	he C. 1	<b>W. I.</b> ]	N. C.	Staff					48,500
8.	Soil Surveys				•	•								17,000
4.	Temporary Buildings .				•									10,000
5.	Discharge and Silt Observat	ions			•		•							69,310
6.	Meteorological surveys .		-	•		•	•							2,000
7.	Geological investigations and	l mine	ral surv	eys			•			•				1,87,960
8.	Communications				•	•	•			•				15,000
9.	Special T. & P. for laborator	у арра	ratus f	or So	il Sur	vey	•	•		•				11,000
10.	Electric load and property s	urveys						•					•	15,000
11.	Working of motor vehicles		•		•	•	•	•	•	•				30,000
12.	Establishment	•	•	•	•	•	•		•	•	•	•		2,84,886
13.	Tools and plant	•	•		•	•	•	•	•	•			•	1,63,083
14.	Contingencies and Sundries	•	•	•	•	•	•	•	•	•	•	٠		69,767
<u> </u>	a. Ž			430			22		•	Grani	Тот.	ÀΤ		15,10,000



#### DETAILS

Serial No.	Itom	Estin	nated cost	Total
	O		Rs.	Rs.
1.	Survey through the Survey of India staff  (a) Survey of reservoir areas scale 4"= 1 mile		32,000	• •
	100 sq. miles @ 320/- per sq. mile.  (b) Contoured survey of Irrigation area scale 4" = 1 mile.		5,52,500	••
	850 sq. miles @ Rs. 650/- per sq. mile.		2,000	5,86,500
•	(c) Rapid 2" scale map of Dharoi Dam site		2,000	0,0.,00
2.	Other river and land surveys to be carried out by C.W.I.N.C. staff.			
	(a) Survey of dam site areas (scale 1/1000) contour interval 5' to 10', 10 sq. miles @ Rs. 2,600 per sq. mile.		26,000	• •
	(b) Longitudinal section of the river and its tributarios with cross-sections (500 miles @ Rs. 25 per mile).		12,500	• •
	(c) Mapping shoals, sand bars, deep channels and installing guages.		5,000	• •
	(d) Miscellaneous surveys such as canal alignment, special reservoir surveys, etc.		5,000	48,500
3.	Soil surveys			
	Work Charged establishment for one year.  4 Auger Mukadams @ Rs. 55 p.m. for one year = 2,640 16 Khalasies @ Rs. 45 p.m. for one year = 8,640			
	T. A. for work charged establishment = 720			
	12,000		12,000	
			5,000	17,000
	Testing Water and soil samples, for one year	•	10,000	10,000
<b>2.</b>	Temporary Buildings			,
5.	(a) There will be four discharge sites on Sabarmati and 6 discharge sites on its tributaries.			
	Non-recurring expenditure per site on Sabarmati.			
	Current meter   per site	. 500		
	Boat large	800		
	Discharge rods	100		
	Ropes	300		
	Sounding rods	100		
	<del>-</del>	1,800		
	For 4 sites non-recurring expenditure	7,200		
	Recurring expenditure (for 2 years) per site on Sabarmati.			
	dobserver @ Rs. 150/- p.m. including dearness allow-			
	ance and special pay for 11 years	1,800		
	One boatman @ Rs. 60 p.m. for 11 years	1,080		
	4 khalasies @ Rs. 55 p.m. for livears	3,960		
		6,840		
	Programing ownerediture for A sites — 4 × 6840	27,360		
	Resurring expenditure for 4 sites $= 4 \times 6840$ Non-recurring expenditure per site on a tributary of Sabarmati	<b>27,0</b> 00		
	deurrent meter	250		
	Boat small	400		
	Discharge rods and sounding rods	. 100		
	Ropes	100		
		850		

### Details-Contd.

rial Vo:	I tem		Estimated cost	Total
			Rs.	Rs.
	Non-recurring expenditure for 6 sites = $6 \times 850$ .	5,100		
	Recurring expenditure (for 2 years) per site on a tributary of Sabarmati.			
	observer @ Rs. 150 p.m. including dearness allow- ance and special pay for 2 years	1,800		
	One boatman @ Rs. 55 p.m. for 1 year	660		
	2 khalasies also suitable as boatsmen @ Rs. 50 p.m. for I year	1,200		
	•	3,660		
	Recurring expenditure for 6 sites on tributaries of Sabarmati $= 6 \times 3,660$	21,960	61,620	
	(b) Silt observations			
	Equipment Work charged establishment for 1; years.	4,000		
	Laboratory Assistant @ Rs. 150 p.m. for 11 years	2,700		
	l Khalasi @ Rs. 55 p.m. for li years	990		
	eteorological Surveys—	7,690	7,690	69,310
	Rain guages, temperatures, humidity & wind veloc y observa- tions		2,000	2,000
7. G	eological investigations and mineral Surveys— (a) Equipment (non-recurring)			
	2 diamond drills with equipment @ Rs. 30,000 each	60,000		
	2 diamonds and spares for the above @ Rs. 20,000 each .	40,000		
	1 Calyx drill with equipment	20,000		
	Spares for the above	10,000		
	2 large boats for drills @ Rs. 1,000 each	2,000		
	2 compressors @ Rs. 5,000 each .	1,42,000	1,42,000	
	(b) Running expenses for one year	2,12,000	2,12,000	
	One Drill foreman @ Rs. 1,500 p.m. for one year	18,000		
	One Resident Asstt. Geologist @ Rs. 350 p.m. for one year	4,200		
	2 Operators @ Rs. 120 p.m	2,880		
	4 helpers @ Rs. 60 p.m	2,880		
	Dearness allowance & T. A. of staff	10,000		
	Running expenses for engines for drills, etc.	8,000		
8. C	ommunications—	45,960	45,960	187,960
J. U	Constructing and maintaining temporary roads to various dam sites and gauging stations.	•	15,000	15,000
9. S	pecial Tools and Plant for laboratory, apparatus for soil surveys		11,000	11,00
	Rectric load and property Surveys		15,000	15,00
11. W	Forking of motor vehicles (for 2 years @ Rs. 15,000 per year) .		30,000	30,00
12. Est	tablishment			
	(a) Pay of Officers			
	1 Executive Engineer @ Rs. 760 p.m. for 2 years .	18,240		
	3 Asstt. Engineers @ Rs. 350 p.m. for 2 years	25,200		
	1 Soil Physicist @ Rs. 275 p.m. for one year	3,300	46,740	
	(b) Pay of Establishment—			
	12 Supervisors @ Rs. 140 p.m. for 2 years	40,320		

## Details-Contd.

rial lo.	Item						Estimated cost	Total
	l Accountant @ Rs. 200 p.m. fo	r 2 v	oars				4,800	······································
	l Head Clerk @ Rs. 160 p.m. fo	-					3,840	
	1 Sub-Assistant Surgeon @ Rs.	•		for 2 v	PARTE		4,800	
	5 Clerks @ Rs. 80 p.m. for 2 year	•				•	9,600	
	8 Sub-Divisional Clerks @ Rs. 7		· fo	, 0 va	ara	•	5,400	
	l Accounts Clerk @ Rs. 100 p.m				W. P	•	2,400	•
	l Head Draftsman @ Rs. 300 p		-		•	•	7,200	
	1 Junior Draftsman @ Rs. 100		_		•	•	2,400	
	2 Tracers @ Rs. 60 p.m. for 2 y		.01 2	Acres	•	•	2,880	
	1 Computer @ Rs. 60 p.m. for 2			•	•	•	1,440	
		-		•	•	•		
	l Ferro Printer @ Rs. 60 p.m. for			•	•	•	1,440	
	1 Dispenser @ Rs. 80 p.m. for 2	-		•	•	•	1,920	
	1 Storekeeper @ Rs. 80 p.m. for			•	•	•	1,920	
	4 Daffadars @ Rs. 35 p.m. for 2			•	•	•	3,360	
	5 Barkandazes @ Rs. 30 p.m. fo	_		•	•	•	3,600	
	2 Sub-overseers @ Rs. 60 p.m. fo	-				0	2,880	
	9 Peons (3 for Division, 2 for years @ Rs. 30 p.m. 2 Peons (1 for Ass. Geologist, 1	•	٠	10.35	n.		6,480	
	@ Rs. 30 p.m. 4 Peons for Officers (one for E	16	1.3			34	720	
	S.D.O's) for 2 years @ Rs. 30	p.m.			OUOT		2,880	
	6 Chowkidars @ Rs. 30 p.m. for		rs		37.7	•	4,320	
	l Daftri @ Rs. 35 p.m. for 2 yea		•		1	•	840	
	6 Dak Runners @ Rs. 30 p.m. fo	-	1	1 1 1		•	4,320	
	12 Khallasies @ Rs. 30 p.m. for 2	-	0 1	龙北	ditt.	•	8,640	
	11 Gauge-readers @ Rs. 30 p.m. f		to be	000		1	7,920	
	l Laboratory Attendant @ Rs. 4	To.	100			1.	720	
	2 Clerks for Asstt. Geologist and year @ Rs. 40 p.m.	•	*	artia.	चर्गति	ne •	960 .	
	3 Clerks special pay for hand	lling	cash	for 2	year	1	1,440	
	@ Rs. 20 p.m	•	•	•	•	•	2,000	
	deologist statt for one year .	•	•	•	•	• -	2,000	
							1,41;440 1,41	,440
(	(c) Dearness allowance for officers	•	•	•	•	•	8	,000
	(d) Dearness allowance for establish	ment			•	•	24,	,000
	(e) Travelling allowance for officers	_						
	Executive Engineer (2 years)		•	•	•	•	7,200	
	Asstt. Engineers (2 years)	•	•	•	•	•	8,600	
	Asstt. Geologist (1 year) .	•		•	•	•	1,800	
	Soil Physicist (1 year) .			•			1,800	
					,	-	<del></del>	400
							19,400 19	,400
(	f) Travelling allowance for establish	nmen	t					
,	Overseers (2 years)	•		•	•	•	21,600	
	Other Staff (2 years)					•	10,000	
	Geologists, Staff (1 year) .	•					1,400	
							33,000 33	,000

## Details- Contd.

S. No.	Item			Estimated cost	Total
	(g) Establishment Contingencies—  Rent for divisional and Sub-Divisional offices for 2 years  Rent for Soil Physicist's office for 1 year  Rent for Asstt. Geologist's office for 1 year  Rent for Laboratory for 1½ years	•	7,000 1,500 1,500 2,300		
	Treme for Danotatory for 14 years		12,300	12,300	2,84,8
13. T	COOLS AND PLANT			24,000	_,0_,0
	(a) Scientific instruments and drawing materials—				
•	5 No. Levelling instruments with stand @ Rs. 700 each .			3,500	
	l No. Theodolite with stand @ Rs. 1,000 each	•	•	1,000	
	5 No. Prismatic compasses with stand @ Rs. 160 each	•	•	800	
	5 No. Planetables with stand @ Rs. 100 each	•	• •	500	
	14 No. L velling staves @ Rs. 40 each	•	•	560	
	4 No. Scale boxes complete with scales and offsets @ Rs. 15 es	eah	•	60	
	2 No. Planimeters @ Rs. 200 each	BQ11	• •	400	
	20 No. Tapes metallic 100 feet @ Rs. 30 each	•	•	600	
	20 No. Tapes metallic 50 ft. @ Rs. 20/- each	•	•	400	
	2 No. Instrument drawing boxes 1st size @ Rs. 300 each	•	• •	800	
	4 No. Instrument drawing boxes 2nd size @ Rs. 200 each	•		800	
	to the second se	•	• •		
	6 No. Instrument drawing boxes 3rd size @ Rs. 100 each 2 No. parallel rulers @ Rs. 40 each	•	•	600	
	Set squares of sizes L. S.		• •	80	
		•		100	
	7 No. Drawing boards @ Rs. 30 each		• •	210	
	7 No. T. Squares @ Rs. 10 each		• •	70	
	18 No. Measuring Chains 100 feet long with arrows @ Rs. 40 ea		• •	720	
	6 No. Measuring chains 66 feet long with arrows @ Rs. 30 each	a .	•	180	
	2 No. French curve boxes @ Rs. 30 each	•	•	60	
	2 No. Straight edges brass @ Rs. 30 each		•	60	
	5 No. Rulers 2 feet fourfold @ Rs. 8 each			40	
	1 Slide rule @ Rs. 200 each		• •	200	
	5 Colour boxes complete @ Rs. 50 each		•	250	
	12 No. China slabs for colours @ Rs. 3 each		•	36:	
	2 No. Steel tapes @ Rs. 100 each			200	•
	1 No. Apparatus for printing plans		•	800.,	
	2 No. proportional compasses @Rs. 30 each		•	<b>6</b> 0.	
	2 No. Glasses magnifying @ Rs. 40 each		•	80	
	18 No. Poles surveying @ Rs. 15 each			270	
	24 No. Ranging rods @ Rs. 5 each		•	120	
	18 No. Umbrellas field @ Rs. 50 each		•	900	
	12 No. Chronographs @ Rs. 90 each	•	•	1,080	
	1 Camera @ Rs. 400 each	•	•	400 800	
	22200	·	·	16,036	16,086
141	Plants and Machinery—				,
(0)	1 G.M.C. Truck @ Rs. 10,000 each			10,000	
	4 Weapon carriers @ Rs. 7,000 each	•	•	28,000	
	6 Jeeps with trailers @ Rs. 6,000 each	•	•	36,000	
				74,000	74,000

### Details-Contd.

Tools—	_					
					<del></del>	
6 No. Augers with extension pieces @ Rs. 100 each .					600	
6 No. axes carpenters @ Rs. 15 each		•		•	90	
2 No. hammers of sizes @ Rs. 5 each					_ 60	
24 No. G. I. Buckets @ Rs. 4 each					96	
24 No. axes country @ Rs. 8 each					192	
2 No. hammers stone breaking @ Rs. 2 each					24	
Pegs iron and nails L.S			:		100	
24 No. Pick axes @ Rs. 5 each		•			120	
2 No. Plumbs brass @ Rs. 3 each ·		•	•	•	36	
6 No. Saws Hand @ Rs. 8 each					<b>4</b> 8	
1 No. stoncil plate figures @ Rs. 25 each	•				25	
1 No. stencil plate letters @ Rs. 30 each					<b>3</b> 0	
4 No. Fire buckets @ Rs. 4 each ·					96	
4 No. Iron safes @ Rs. 400 each					1,600	
						3,11
e10083						0,
Camp equipment—						
12 No. chairs folding with arms @ Rs. 16 each	•			•	192	
24 No. tables camp folding @ Rs. 35 each		•		•	840	
12 No. Cotton durries @ Rs. 80 each				•	960	
16 No. Yakdans (record boxes) @ Rs. 40 each					640	
					1,200	
6 No. Swiss cottage double fly tents $12' \times 12'$ @ Rs. 1,000	0	•	•	•	6,000	
20 No. double fly tents $10' \times 10'$ @ Rz. 700 each				*	14,000	
20 No. tent double fly 8' × 8' @ Rs. 500 each	•	•		•	10,000	
12 No. sorvants tents @ Rs. 600 each	•	•	•	•	7,200	
12 No. shouldaries @ Rs. 600 each .	•	•	•	•	7,200	
6 No. necessary tents @ Rs. 150 each . A	•	٠.	•	٠	900	
	•			•	35	
7 Wash hand basins @ Rs. 4 each	•		•	•	28	
7 Jugs @ Rs. 4 each	•	•	•	•	28	
6 Cots folding @ Rs. 50 each	•	•		•	300	
86 Country charpoys @ Rs. 9 each	•	•	•	•	324	
4 Lamps petromax @ Rs. 50 each	•	•	•	•	200	
24 Hurricane lanterns @ Rs. 5 each		•	•	•	120	
7 Buckets G.I. @ Rs. 5 each	•	•	•	•	35	
4 Boxes for petromax lanterns @ Rs. 5 each	•	•	•	•	20	
Affice furniture—					50,222	50,22
					рŤк	
	60 e	ach	•	•		
			•	•	•	
	<u>.</u>	•	•	•		
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	24 No. axes country @ Rs. 8 each 2 No. hammers stone breaking @ Rs. 2 each Pegs iron and nails L.S. 4 No. Pick axes @ Rs. 5 each 2 No. Plumbs brass @ Rs. 3 each 6 No. Saws Hand @ Rs. 8 each 1 No. stoncil plate figures @ Rs. 25 each 1 No. stencil plate letters @ Rs. 30 each 4 No. Fire buckets @ Rs. 4 each 4 No. Iron safes @ Rs. 400 each  2 No. chairs folding with arms @ Rs. 18 each 2 No. chairs folding with arms @ Rs. 18 each 1 No. Swiss cottage double fly tent 14' × 14' @ Rs. 1,200 6 No. Swiss cottage double fly tents 12' × 12' @ Rs. 1,000 20 No. double fly tents 10' × 10' @ Rs. 700 each 12 No. sorvants tents @ Rs. 600 each 12 No. sorvants tents @ Rs. 600 each 12 No. shouldaries @ Rs. 600 each 6 No. necessary tents @ Rs. 150 each 7 Hath Boards wooden @ Rs. 5 each 7 Use @ Rs. 4 each 6 Cots folding @ Rs. 50 each 86 Country charpoys @ Rs. 9 each 4 Lamps petromax @ Rs. 50 each 7 Buckets G.I. @ Rs. 5 each 7 Buckets G.I. @ Rs. 5 each 7 Buckets G.I. @ Rs. 5 each 7 Hoo. tables for officers @ Rs. 125 each 7 Hoo. tables for officers @ Rs. 125 each 7 Mo. tables for officers @ Rs. 125 each	2 No. hammers stone breaking @ Rs. 2 each Pegs iron and nails L.S. 4 No. Pick axes @ Rs. 5 each 2 No. Plumbs brass @ Rs. 3 each 6 No. Saws Hand @ Rs. 8 each 1 No. stoncil plate figures @ Rs. 25 each 1 No. stencil plate letters @ Rs. 30 each 4 No. Firo buckets @ Rs. 400 each 4 No. Firo buckets @ Rs. 400 each 4 No. Iron safes @ Rs. 400 each 2 No. chairs folding with arms @ Rs. 18 each 12 No. chairs folding with arms @ Rs. 35 each 12 No. Cotton durries @ Rs. 80 each 16 No. Yakdans (record boxes) @ Rs. 40 each 1 No. Swiss cottage double fly tent 14'×14' @ Rs. 1,200 6 No. Swiss cottage double fly tents 12'×12' @ Rs. 1,000 20 No. double fly tents 10'×10' @ Rs. 700 each 20 No. tent double fly 8'×8' @ Rs. 500 each 12 No. sorvants tents @ Rs. 600 each 12 No. shouldaries @ Rs. 600 each 6 No. necessary tents @ Rs. 150 each 7 Bath Boards wooden @ Rs. 5 each 7 Wash hand basins @ Rs. 4 each 6 Cots folding @ Rs. 50 each 86 Country charpoys @ Rs. 9 each 4 Lamps petromax @ Rs. 50 each 24 Hurricane lanterns @ Rs. 50 each 7 Buckets G.I. @ Rs. 50 each 86 Country charpoys @ Rs. 9 each 4 Lamps petromax @ Rs. 50 each 7 Buckets G.I. @ Rs. 5 each 7 No. tables with two drawers, handles and locks @ Rs. 60 each 86 No. Cupboards with shelves & Locks @ Rs. 35 each 86 No. Office cane chairs @ Rs. 15 each 86 No. Cupboards with shelves & Locks @ Rs. 100 86 No. record stands with shelves @ Rs. 35 each	2 No. hammers stone breaking @ Rs. 2 each Pegs iron and nails L.S. 4 No. Pick axes @ Rs. 5 each 2 No. Plumbs brass @ Rs. 3 each 6 No. Saws Hand @ Rs. 8 each 1 No. stoncil plate figures @ Rs. 25 each 1 No. stoncil plate letters @ Rs. 30 each 4 No. Fire buckets @ Rs. 4 each 4 No. Iron safes @ Rs. 400 each  Camp equipment—  12 No. chairs folding with arms @ Rs. 16 each 12 No. chairs folding with arms @ Rs. 40 each 1 No. Yakdans (record boxes) @ Rs. 40 each 1 No. Swiss cottage double fly tent 14'×14' @ Rs. 1,200 6 No. Swiss cottage double fly tents 12'×12' @ Rs. 1,000 20 No. double fly tents 10'×10' @ Rs. 700 each 12 No. stonuldaries @ Rs. 600 each 12 No. sorvants tents @ Rs. 600 each 12 No. shouldaries @ Rs. 600 each 6 No. necessary tents @ Rs. 150 each 7 Wash hand basins @ Rs. 4 each 7 Jugs @ Rs. 4 each 6 Cots folding @ Rs. 50 each 16 Cots folding @ Rs. 50 each 17 Wash hand basins @ Rs. 5 each 18 Country charpoys @ Rs. 9 each 18 Lamps petromax @ Rs. 50 each 18 Country charpoys @ Rs. 9 each 19 Hurricane lanterns @ Rs. 5 each 10 Boxes for petromax alanterns @ Rs. 5 each 11 Boxes for officers @ Rs. 150 each 12 No. tables camp folding for clerks @ Rs. 35 each 18 No. tables camp folding for clerks @ Rs. 35 each 18 No. caps cane chairs @ Rs. 15 each 16 No. caps cane chairs @ Rs. 15 each 16 No. caps cane chairs @ Rs. 30 each 16 No. caps cane chairs @ Rs. 30 each 16 No. cupboards with shelves & Locks @ Rs. 100 18 No. record stands with shelves & Locks @ Rs. 100	A No. axes country @ Rs. 8 each 2 No. hammers stone breaking @ Rs. 2 each Pegs iron and nails L.S. 4 No. Pick axes @ Rs. 5 each 2 No. Plumbs brass @ Rs. 3 each 6 No. Saws Hand @ Rs. 8 each 1 No. stoncil plate figures @ Rs. 25 each 1 No. stoncil plate figures @ Rs. 30 each 4 No. Firo buckets @ Rs. 4 each 4 No. Firo buckets @ Rs. 4 each 4 No. Iron safes @ Rs. 400 each  Camp equipment— 12 No. chairs folding with arms @ Rs. 16 each 24 No. tables camp folding @ Rs. 35 each 1 No. Swiss cottage double fly tent 14' × 14' @ Rs. 1,200 6 No. Swiss cottage double fly tents 12' × 12' @ Rs. 1,000 20 No. double fly tents 10' × 10' @ Rs. 700 each 22 No. sorvants tents @ Rs. 600 each 12 No. shouldaries @ Rs. 600 each 12 No. shouldaries @ Rs. 600 each 6 No. necessary tents @ Rs. 150 each 7 Bath Boards wooden @ Rs. 5 each 7 Uses hand basins @ Rs. 4 each 7 Uses @ Rs. 4 each 6 Cots folding @ Rs. 50 each 86 Country charpoys @ Rs. 9 each 4 Lamps petromax @ Rs. 50 each 86 Country charpoys @ Rs. 9 each 4 Harricane lanterns @ Rs. 5 each 7 Buckets G.I. @ Rs. 5 each 8 Buckets G.I. @ Rs. 5 each 9 Buckets G.I. @ Rs. 5 each 1 No. tables camp folding for clerks @ Rs. 35 each 1 No. tables with two drawers, handles and locks @ Rs. 60 each 16 No. tables with two drawers, handles and locks @ Rs. 60 each 18 No. Office cane chairs @ Rs. 15 each 16 No. tables camp folding for clerks @ Rs. 35 each 16 No. cupboards with shelves & Locks @ Rs. 100 16 No. Cupboards with shelves & Locks @ Rs. 100 16 No. record stands with shelves @ Rs. 35 each	A No. axes country @ Rs. 8 each 2 No. hammers stone breaking @ Rs. 2 each Pegs iron and nails L.S. 4 No. Pick axes @ Rs. 5 each 2 No. Plumbs brass @ Rs. 3 each 1 No. stoncil plate figures @ Rs. 25 each 1 No. stencil plate letters @ Rs. 30 each 4 No. Fire buckets @ Rs. 4 each 4 No. Iron safes @ Rs. 400 each  2 No. chairs folding with arms @ Rs. 18 each 2 No. tables camp folding @ Rs. 35 each 1 No. Swiss cottage double fly tent 14'×14' @ Rs. 1,200 6 No. Swiss cottage double fly tent 12'×12' @ Rs. 1,000 20 No. double fly tents 10'×10' @ Rs. 700 each 12 No. sorvants tents @ Rs. 600 each 12 No. sorvants tents @ Rs. 600 each 12 No. sorvants tents @ Rs. 600 each 12 No. shouldaries @ Rs. 600 each 12 No. shouldaries @ Rs. 600 each 6 No. necessary tents @ Rs. 5 each 7 Jugs @ Rs. 4 each 6 Cots folding @ Rs. 50 each 8 Country charpoys @ Rs. 9 each 4 Lamps petromax @ Rs. 50 each 8 Buckets G.I. @ Rs. 50 each 7 Buckets G.I. @ Rs. 50 each 8 Hurricane lanterns @ Rs. 50 each 9 Buckets G.I. @ Rs. 5 each 7 No. tables for officers @ Rs. 126 each 7 No. tables for officers @ Rs. 126 each 8 No. Office canc chairs @ Rs. 15 each 1 No. Office canc chairs @ Rs. 15 each 6 No. easy cane chairs @ Rs. 50 each 8 No. Office canc chairs @ Rs. 5 each 1 No. Cupboards with shelves & Locks @ Rs. 35 each 1 No. Office canc chairs @ Rs. 30 each 1 No. Cupboards with shelves & Locks @ Rs. 150 1 No. record stands with shelves & Locks @ Rs. 150 2 No. record stands with shelves & Locks @ Rs. 150 2 No. record stands with shelves @ Rs. 35 each	192 2 No. axes country @ Rs. 8 each 192 2 No. hammers stone breaking @ Rs. 2 each 24 24 Pegs iron and nails L.S. 100 2 No. Pick axes @ Rs. 5 each 120 2 No. Pick axes @ Rs. 5 each 120 2 No. Plumbs brass @ Rs. 3 each 36 6 No. Saws Hand @ Rs. 8 each 48 1 No. stoncil plate figures @ Rs. 25 each 25 1 No. stoncil plate figures @ Rs. 30 each 30 4 No. Fire buckets @ Rs. 4 each 96 4 No. Fire buckets @ Rs. 4 each 160 3,117

#### Details -Contd.

8. <b>N</b> o.	<u> </u>			Item			· · · · ·					Estimated cost	Total
	7 No. Benches for peo	na @	Re.	25 each								178	
	12 No. Tespoys @ P			•		•	•		•	•	٠.	180	
	20 No. Hurricane las			s. 5 eac	h.	•		•	•			100	
	4 No. cupboards wifor plans @ Rs. 12			vers 8"	high •	each	, 3′ wi	de 4'	long a	nd 5	high	500	
	12 No. Buckets G. I.			ach	•				- •		•	60	
	14 No. baskets waste	_			<b>ch</b>							42	
	16 No. call bells @ I		_			•		•	•			64	
	12 No. stools wooden			ach					•		•	72	
	l No. Typewriter p	ortable	@ I	Rs. 300			•					300	
	5 No. typewriters R		_		Rs. 4	50 e	ch .					2,250	
	5 Nos. scales with v	reight	Bl to	20 tol	Ma @	Rs. 3	0 each	ı .		•		150	
	12 Nos. cash and sta	mps b	BOKO	steel @	Rs.	20 <b>c</b> a	ch .	•			. •	240	
	5 pigeon holes for d	espate	h cle	rks @	Rs. 5	oac	h .	٠.	٠.	٠.	•	250	
Miss	cellaneous petty item	s much	88 T	en-knis	768. A	oisson	s. loci	sa. in	ketand	. liv	eries		
	peons, etc	•		•	•	•			•	•	•	1,500	
						65	STEEN.				•	11,708	11,70
•	R. & C. of T. & P.—	•	•	٠					٠	•	•	8,000	8,0
	Scientific instrument	s and	Draw	ing ma	torial	B .				•	•	16,036	
	Plants and Machiner	у.	•	•	4	97.		<i>"</i> .	•		٠.	74,000	
	Tools	•	•	•		Mi.			•	٠	•	3,117	
	Camp equipage .	•	•	•			1.0		•		•	50,222	
	Office furniture .	•	•	•	,0,		1-2	1	•	•	•	11,708	
	R. & C. of T. & P.	•	•	•			or it		•	•	•	8,000	
					115	2010	, , i.		TOTAL	6	•	1,63,083	1,63,0
								-					

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## YEARLY DISTRIBUTION OF THE AMOUNT OF THE OVERALL ESTIMATE FOR SABARMATI INVESTIGATIONS

Serial No.	Item		Estimated amount	Probable 1948-49 6 months	Expend 1949-50	liture 1950-51			
						Ra.	Rs.	Rs.	Ra.
. 1	Surveys through the Survey of Indiadirection of C.W. I.N.C	. 8	taff u	nder •	the	5,86,500	42,000	3,22,500	2,22,000
2	Other river and land surveys to be c C.W.I.N.C. staff	arri	ed out	by		48,500	6,000	28,500	1,400
3	Soil Surveys		•			17,000	• •	17,000	••
4	Temporary Buildings	•	•		•	10,000	5,000	5,000	••
5	Discharge and Silt Observations		•	•	•	69,310	17,000	34,310	18,000
6	Meteorological Surveys	•		•	•	2,000	1,000	600	400
7	Geological investigations and Mineral	sur	veys			1,87,960	25,000	1,62,960	• •
8	Communications				•	15,000	10,000	5,000	• •
9	Special T. & P. for Laboratory, Appar	ratu	a for a	oil St	irveys	11,000	11,000	• •	• •
10	Electric load and property surveys				•	15,000	••	15,000	••
11	Working of motor vehicles				•	30,000	7,500	15,000	7,500
12	Establishment	•		•	250.	2,84,880	70,000	1,44,880	70,000
13	T. & P		· The		31.	1,63,083	40,000	1,13,083	10,000
14	Contingencies and Sundries .		GIL		21.4	69,767	15,500	36,167	18,100
	TGTAL				t lorr	15,10,000	2,50,000	9,00,000	3,60,000

(8d) M.D. MITHAL, Director, Irrigation and Waterways.

सन्त्रपेव जवने

Estimate for Preliminary Surveys and Investigations in connection with Projects for Multipurpose Development of the Sabarmati Basin Prepared in Accordance with the Instructions of the AD-HOC Committee

## ABSTRACT

I. WORKS															
1. Dams and Appurtena	at wo	ka—													
A. preliminary Expe	1808				•										75,120
K. Buildings .			•						•						10,000
2. Main Canal and Bran	ches							•							1,44,900
3. Discharge and Silt O	DECTVE	tions				•	•				•				33,400
4. Meteorological Observ	vation	1.6			٠.	•									2,000
5. Mineral Surveys			•		•										5,000
6. Surveys for Pisciculti	110		•			•									1,000
7. Malaria Surveys	•	•	•		•		•	•							2,000
8. Electrical Load Surve	ув			•	•		•			•					10,000
9. Economic and Proper	rty Su	rveys													5,000
10. Communications	•									•					10,000
11. Special Tools and Pla	int	•	•	•	•		•	•	•						71,000
							•								3,69,420
2% cont	ingen	cios				•			•						7,388
						$\rho_{\rm sp} h$	5				m-	4-1 77	to mlm	•	2 70 000
II. TOOLS AND PLANT					57	THE	96	25			10	tal W	OFKS	•	3,76,808
Tools and Plant	•	•	•			442	2/3	O. •		•		•	•		1,41,000
	29	6 con	tinger	acies		7		8		•	•	•	•	•	2,820
															1,43,820
III. ESTABLISHMENT	•		•		- 7	THE STATE OF				. •		•			2,66,210
					1	AG	111			-	BAND	Tom			7,86,838
					والجور	114	41144	-		•	IDANL	-	Say	•	
					1		1						) <b>n</b> y	•	7,87,000
					420	生活の	tall!								

(Sd.) M. D. MITHAL,
Director, Irrigation and Waterways.

## **DETAILS**

				<i></i>	C1 1 1/12)								
I. WORKS—													
Dams and Appurtenant													
A. Preliminary Expensed 1. Survey of the reservoir		Ain m	, hotomor	he on	d cross	nd m	1900	and r	alottis		ntour	at	
10 ft.—5ft. intervals on				niy au	a Ston	mich Br	плой	and I	PIODOLI	1R co	nvour	o capo	
40 square miles @ 375/p	_			•	•	•			•	٠	•	•	15,000
<ol> <li>Survey of the dam sites of 32"=1 Mile.</li> </ol>	and weir	sites by	air phot	ograph	y and	grou	nd sur	veys a	and p	ottin	g on s	cale	
1280 acres @ 4-0 per acr	re											•	5,120
3. Rapid 2" map of Dharo	i dam site									•	· •		2,000
<ol> <li>Geological Investigation by boring, core drilling,</li> </ol>	n for found making d	dations or rifts and	of the de l tunnell	m site ing, et	s and c. inclu	weir a iding	ites s testin	nd of	the r	oserv	oir ba	sins	
46 holes each of 50—230	_					•	•	•	•	•	•	•	46,000
<ol> <li>Soil analysis and burro</li> <li>Model experiments by t</li> </ol>					_	eting		•	•	•	•	•	5,000 2,000
or moder experiments by	no manan	AA GRADT A	ays near	1011 1 0	OHA		•	•	•	•	•	•	
K. Buildings													75,120
Temporary Buildings									٠.				10,000
II. Main Canals and Branch	AQ.	•	•		_	٠,	Ť	-	•	Ť	·	-	
(a) Surveys of the comr		aa for al	ionment	of can	alo								
1,20,000 acres @ 1-2-0			Rutnotto	OI CHI									1,35,000
(b) Miscellaneous Survey	-		1			3						• \	5,000
(c) Longitudinal Section		iver an	d ita trib	nutario	a with	cross	Recti	ona 1	00 mi	les 6	25/-		·
per mile.	•	•	\$1-7 640					•	•		•	•	2,500
(d) Soil Surveys, L.S.		•	4				•	•	•		•	•	2,400
													1,44,900
III. Discharge and Silt obset and four khallasies at e and laboratory equipmer	ach discha	Period O orge site	ctober 1	948 to ropes	May 19 , disch	050= arge	20 mo rods,	nths). floats	One	908, a	tman ilt sar	nplers	
4 sites at Rs. 5,000/- per	site per y	ear for 2	20 month	ıs.						•			33,400
IV. Meteorological observation	ons, rainge	auges, te	mperatu	re, hu	midity	and '	wind '	veloci	ty obs	ervat	ions		2,000
V. Mineral Surveys		•		444 144	1 444								5,000
VI. Surveys for Pisciculture		•				,					•		1,000
VII. Malaria Surveys		•											2,000
VIII. Electrical Load Surve	ys												10,000
IX. Economic and Property													5,000
X. Communications													10,000
XI. Special Tools and Plant	. 1 Diamo	nd drill	complete	e with	&CCORRC	ories (	@ Rs.	60.00	00 евс	h.		١.	60,000
Testing apparatus and l											moist	ure	
content, consolidation, e	etc.	· darba				•			,	•	•	•	11,000
•			_									,	71,000
													3,69,420
	2% cont	ingenci	88 .	•	•	•	•	•	•	•	•	•	7,388
	Total	work									•	•	3,76,808
II. TOOLS AND PLANT													
1. Motor vehicles for su	rvey part	ies. 7 v	vehic <b>le</b> s (	@ 7000	)/- eacl	ı	•	•				•	49,000
2. Working expenses fo				•	•	•	•	•	•	•	•	•	22,000
3. Scientific instrument	s and drav	wing ma	terials	•	•	•	•	•	•	•	•	•	30,000

. Ordinary Tools and Plan	at			•		•	•	•			•			5,00
i. Camp equipage		•					•	•			•		• •	15,00
6. Office Furniture				. ′				**		•				15,00
7. R. & C. of T. & P.		•	•		•	•			•	•	•	•	•	5,00
	***													1,41,00
	2% cont	ingen	cies	•	•	•	•	•	•	•	•	•	٠	2,82
	Total To	ols an	d Pla	nt									•	1,43,82
ESTABLISHMENT—														
1. Pay of Officers-														
Executive Engine	er l No. @	875	/- p. z	a. for	15 m	onths								18,12
Assistant Enginee	rs 8 No. @	3 560	/· p.n	. for	15 m	onthe							• •	25,20
Asatt. Geologist 1														8,00
Drill Foreman 1 N	No. @ 1000	0/- p.i	m. for	6 mo	ntha									6,00
													_	47,32
2. Pay of Establishment														
Accountant 1 No.		.m. fo	r 16 r	panth:										9.00
Head Clerk 1 No.						•	•	•	•	•	•	•	•	3,00
Senior Clerk 3 Nos						•	•	•	•	•	•	•	•	2,70
Storekeeper 1 No.								•	•	•	•	•	•	6,78
Senior Draftsman				Action to the last of the last	NAME OF TAXABLE PARTY.	3/15,	23	•	•	•	•	•	•	2,2
Junior Clerks 7 No								•	•	•	•	•	•	3,00
Junior Draftsman							21	•	•	•	•	•	•	9,76
Tracers 2 Nos. @				10 N 3-1	HOM	410	ii.	٠.	•	•	•	•	•	2,14
Sub-Assistant Sur	• •			Part of	PALL.			•	•	•	•	•	•	3,15
Compounder 1 No.						16	•	•	•	•	•	•	•	2,55
Overseers 12 Nos.				2 2	No. 1888	julija la	-	•	•	•	•	•	•	78
Research Assistan				.1 .	100 PM			•	•	•	•	•	•	43,20
Laboratory Asstt.								•	•	•	•	•	•	3,60
Silt Analyst 1 No.						6118		•	•	•	•	•	•	3,45
						i .	1	•	•	•	•	•	•	3,00
Asett. Silt Analyst						ns	1 .	•	•	•	•	•	•	1,39
Gauge readers 5 N		-				•	•	. •	•	•	•	•	•	5,28
Senior Observers 4					iontii	в.	•	•	•	•	•	•	•	5,40
Daffadars 4 Nos. (						•	•	•	•	•	•	•	•	1,98
Barkandazes 5 No					118	•	•	•	•	•	•	•	•	2,47
Peons 13 Nos. @	_					•		•	•	•	•	•	•	6,43
Khallasies for over		_		•				•	•	•	•	•	•	5,94
Laboratory Khalle		_				nonth	3	•	•	•	•	•	•	1,48
Chowkidars 5 Nos.						•	•	•	•	•	•	•	•	2,47
Dak Runners 5 No	•	-				•	•	•	•	•	•	•	•	2,47
Ferro printer 1 No					18	•	•	•	•	•	•	•	•	90
Daftri 1 No. @ 33	· -					٠.,	•	•	•	•	•	•	•	48
Special pay for 3 (	Clerks for I	nandi	ing ce	an ior	15 11	onthe	@ 2	0/- p.:	m.	•	•	•	· <del>_</del>	96
3. Dearness Allowance i	for Officers	for l	5 mo	nths										1,26,88 7,00
4. Dearness Allowance f					nthe	• .	-	•	•	•	•	•		38,0
5. Travelling allowance						•	•	•	•	•	•	•	•	20,0
6. Travelling allowance					onth:		•	•	•	•	•	•	•	15,0
7. Establishments contin								•	•	•	•	•	• .	12,00
Howarington on contra		10	1110111		•	•	•	•	•	•	•	•	٠	
				_		tablis								2,66,21

	TOU	A BLC	NDP	LAN'	r						
l. Plant and Machinery											
Motor vehicles 7 No. @ 7,000/- each											40
Working expenses for 15 months .		•	•	•	•	•	•	•	•	•	49,
•	•	•	•	•	•	•	•	•	•	• _	22,
										_	71,
. Scientific instrument and Drawing materials.											
Levels 12 Nos. @ 850/- each			•								10,
Folding footrules 12 Nos. @ 7/- each											
Plotting scales 12 Nos. @ 30/- each			•								
Set Squares transparent 8" (45° and 60°), 12 g	oaira @	15/-	per pe	ir							
let quality Drawing Instrument box 1 No. @											
2nd quality Drawing instrument boxes 12 No	. @ 62	2/8/ ea	ch								
French curve set 1 No. @ 30/- each	•			•						•	
Parallel rulers 5 Nos. @ 60/- each	•										
Survey Umbrellas 4 Nos. @ 62/8 each			•								
Theodolite 1 No. @ 2.800/- each	•	•			•						2,
Levelling Staves 16 pairs @ 150/- per pair			•	•							2,
One hundred feet chains 16 Nos. @ 40/- each		•									
100 feet Metallic Tapes 20 Nos. @ 30/- each			•								
50 feet Metallic Tapes 20 Nos. @ 24/- each	•										
Plane-table with stand 5 Nos. @ 100/- each		• ===	H17 •					•		•	
Prismatic compasses 41" dia. 4 Nos. @ 310 ca	ch .			printing .						·	1,
Ranging Rods 72 Nos. @ 5/- each	23			4-1		·		•		•	٠,
Large size stanley planimeter 1 No. @ 400/- e	ach .						·	•	•	•	
Small size planimeter 1 No. @ 250/- each	.67			421		Ċ	•	•	•	•	
Stop watches 5 Nos. @ 100/- each	T.			237	·	•	•	•	•	•	
Steel tapes 2 Nos. @ 70/- each				H.	Ċ	·		•	•	•	1
Drawing boards with T. Square 7 Nos. @ 50/-	each	141	14	1	•			•	•	•	
10 inch Slide rule I No. @ 50/- each			314	100	•	•	•	•	•	•	
Clinometers 2 Nos. @ 150/- each	18			7	•	•	•	•	•	•	
6 inch celluloid semicircular protractors 4 Nos	. @ N	- auch		4	•	•	•	•	•	•	
Abney levels in case with stand 2 Nos. @ 360/		- Calcie	201		•	•	•	•	•	•	
36 inch straight edge 1 No. @ 72/- oach .	- 00011	गरमां		À	•	•	•	•	•	•	•
Proportional compasses 2 Mos. @ 30/- each	•		-   ·		•	•	•	•	•	•	
Current meters 4 Mos. @ 1,000/- each	•	•	•	•	•		•	•	•	•	
Magnifying glasses 5 Nos. @ 16/- each	•	•	•	•	•	•	•	•	٠	•	4,0
	•	•	•	•	•	•	•	•	•	•	
Hlue print apparatus 1 No. @ 600/- each	•	•	•	•	•	•	•	•	•	•	•
Camera 1 No. @ 300/- cach	•	•	•	•	•	•	•	•	•	•	3
Prismatic binoculars 2 Nos. @ 250/- each	•	•	•	•	•	•	•	•	•	•	1
66 feet measuring chains 5 Nos. @ 30/- each	•	•	•	•	•	•	•	•	•	•	
Colour boxes complete 3 Nos. @ 50/- each					•	•	•	•	•	•	1
Thina Slabs for colours 12 Nos. @ 2/- each	•	•	•	•	•	•	•	•	•	•	
							To	tal		•	30,0
Ordinary Tools and Plant											
Augers 20 Nos. @ 100/- each											ο Λ
Carpenters axes 6 Nos. @ 20/- each	•	•	•	•	•	-	•	•	•	•	2,0
Country axes 20 Nos. @ 8/- each	•	•	•	•	•	•	•	•	•	•	1
G. I. Buckets 24 Nos. @ 4/- each	•	•	•	•	•	•	•	•	•	•	2
Hammers of size 24 Nos. @ 6/- each	•	•	•	•	•	•	•	•	•	•	1

Copper ghadas for water 10 Nos. @ 15/- sac	ch	_	_									150
Iron pegs and nails L. S	J			•	•	•	:	•	•	•	•	100
Pick axes 48 Nos. @ 6/- each				•	•		•	•	•	•	•	288
Brass Plumbs 24 Nos. @ 3/- each				•	•	·		·	·	•	•.	72
Hand Saws 12 Nos. @ 8/- each		•	•		•	•	•	•	•	•	•	96
Stenoil plate figures 1 No. @ 29/- each		•	•	•	•	•	•	•	•	•	•	29
Steneil plate letters 1 No. @ 30/- each		•	•	•	•	:	•	•	•	•	•	
Fire buckets 48 No. @ 8/- each		•	•	•	•	•	•	•	•	•	•	30
Nail extractors 6 No. @ 10/8/- each		•	•	•	•	•	•	•	•	•	•	384
Phahorahs 48 No. 10/- each		•	•	•	•	•	•	•	•	•	•	6:
•		•	•	•	•	•	•	•	•	•	•	480
Crowbars 24 No. @ 25/- each		•	•	•	•	•	•	•	•	•	•	60
Sundries		•	•	•	•	•	•	•	•	•	•	7:
								7	<b>Fotal</b>	•	•	5,000
Camp Equipage												- <del></del>
Chairs folding 16 No. @ 12 each												19
Tables camp folding 16 No. @ 30/- each .		•	•	•	•	•	•	•	•	•	•	
Swiss cottage double fly tent 1 No. 12'×12		1.000	/- es	ab.	•	•	•	•	•	•	•	48
Double fly tents 10 No. 10' × 10' @ 700 eso	_		/- eax		•	•	•	•	•	•	•	1,00
Shouldaries 12 No. @ 500/- each		•	•	•	•	•	•	•	•	•	•	7,00
37		•	•	•	•	•	•	•	•	•	•	6,00
• • •			TO S	501	•	•	•	•	•	•	•	10
Country charpoys 24 No. @ 8/- each		AM			1	•	•	٠	•	•	•	19
Sundries	0		1			•	•	•	•	•	•	3
	1											15,00
		N. III	MA		2							
Office Furniture		1,07	116		V.							
Officer's Writing tables I No. @ 170/- each		1.7		14, 1	*	•	•	•	•	•	•	1
Writing tables $5^7 \times 3^7 \times 2^{17}$ with oil cloth (			25/-	each	A.	•	•	•	•	•	•	7
Writing table with 2 drawers 25 No. @ 100	J/- e	ach	T.A	117	7	•	•	•	•	•	•	2,5
• •	•	late.		7:35	9	•	•	•	•	•	•	1,0
				- 1			•	•	•			2
Cupboards $6' \times 4' \times 1\frac{1}{4}'$ 16 No. @ 125/- each	h	100	111	F			•					2,0
Record stands $4' \times 3\frac{1}{2}' \times 1\frac{1}{2}'$ I6 No. @ $40/-6$	each						•					6
Steel trunks 16 No. @ 25/- each					•							4
Cupboard $4' \times 3' \times 1\frac{1}{4}'$ 16 No. @ 60/- each												9
Benches with backs 5'×15"×18" 7 No. @	30/-	oach				•						2
Steel stamp boxes 6 No. @ 10/- each	•											
Cotton floor carpets 5 No. @ 100/- each				•						-		
Teapoys 16 No. @ 20/ each										·		
Cupboards 4'×3'×5' with 6 drawers each				ns 6 ]	vo. @	150	each		•	•	•	
	8 h						04011	•	•	•	•	
	8 h	g 10	_			•	•	•	•	•	•	
Waste paper baskets 14 No. @ 2/- oach	8 h			•	Ţ	_						
Waste paper baskets 14 No. @ 2/- each Call Belis 12 No. @ 4/- each	8 h		•	•	•	•	•	•	•	•		
Waste paper baskets 14 No. @ 2/- cach Call Bells 12 No. @ 4/- each Peon belts 13 No. @ 5/- each	•		•	•	•	•	•	•	•	•		
Waste paper baskets 14 No. @ 2/- cach Call Bells 12 No. @ 4/- each Peon belts 13 No. @ 5/- each High Chairs for tracers 2 No. @ 20/- each	•		•	•	•	•	•	•	•	•	•	
Waste paper baskets 14 No. @ 2/- each Call Bells 12 No. @ 4/- each Peon belts 13 No. @ 5/- each High Chairs for tracers 2 No. @ 20/- each Chamber pot I No. @ 5/- each	•		•	•	•	•	•	•	•	•	•	
Waste paper baskets 14 No. @ 2/- each Call Belis 12 No. @ 4/- each Peon belts 13 No. @ 5/- each High Chairs for tracers 2 No. @ 20/- each Chamber pot I No. @ 5/- each Locks 36 No. @ 3/- each	•				•	•	•	•	•	•	•	
Waste paper baskets 14 No. @ 2/- each Call Bells 12 No. @ 4/- each Peon belts 13 No. @ 5/- each High Chairs for tracers 2 No. @ 20/- each Chamber pot I No. @ 5/- each Locks 36 No. @ 3/- each Brass pad locks 8 Nos. @ 15/- each	•	•		•	•	•	•	•	•	•	•	2
Waste paper baskets 14 No. @ 2/- each Call Bells 12 No. @ 4/- each Peon belts 13 No. @ 5/- each High Chairs for tracers 2 No. @ 20/- each Chamber pot I No. @ 5/- each Locks 36 No. @ 3/- each Brass pad locks 8 Nos. @ 15/- each Pigeon holes for despatch clerks 5 No. @ 3		· · · · · ·			•	•	•	•	•	•	•	2
Waste paper baskets 14 No. @ 2/- each Call Bells 12 No. @ 4/- each Peon belts 13 No. @ 5/- each High Chairs for tracers 2 No. @ 20/- each Chamber pot I No. @ 5/- each Locks 36 No. @ 3/- each Brass pad locks 8 Nos. @ 15/- each Pigeon holes for despatch clerks 5 No. @ 3 Scales and weights 5 No. @ 20/- each	25	•			•	•		•	•	•	•	1
Waste paper baskets 14 No. @ 2/- each Call Belis 12 No. @ 4/- each Peon belts 13 No. @ 5/- each High Chairs for tracers 2 No. @ 20/- each Chamber pot I No. @ 5/- each Locks 36 No. @ 3/- each Brass pad locks 8 Nos. @ 15/- each Pigeon holes for despatch clerks 5 No. @ 3 Scales and weights 5 No. @ 20/- each Steel cash boxes 5 No. @ 25/ each	25	· · · · · ·				•		•		•		1 1 1
Waste paper baskets 14 No. @ 2/- each Call Bells 12 No. @ 4/- each Peon belts 13 No. @ 5/- each High Chairs for tracers 2 No. @ 20/- each Chamber pot I No. @ 5/- each Locks 36 No. @ 3/- each Brass pad locks 8 Nos. @ 15/- each Pigeon holes for despatch clerks 5 No. @ 3 Scales and weights 5 No. @ 20/- each	25	· · · · · ·				•		•		•		1 1 1 1 3

Hurricane Lanterns 24 No. @ 5/-each	٠.	٠.	٠.				•		•		120
Table Lamps 10 No. @ 25/- each .					٠.			•			250
Cycles 2 No. @ 225/-each			٠.	٠.							450
Safes 4 No. @ 400/-each		•		٠.							1,600
Stools wooden 12 No. @ 6/- each .						•				•	78
Sundries		•	•	•		•			•	•	374
							To	tal			15,000
6. R. & C. of T. & P											5,000



### Yearly distribution of the amount of the foregoing estimate

												Year 1948-49	Year 1949-50
I. WORKS													
(i) Preliminary Expenses													
1. Survey of reservoir be	asin											7,500	7,500
2. Survey of Dam Site												5,120	
3. Rapid 2" map of Dha	roi da	m site		٠.	•		•		•			2,000	
4. Geological investigati	ons				•	•					•		40,000
5. Soil analysis etc.		•				•					•	5,000	•:
6. Model Experiments		•				•	•						2,000
(ii) Buildings													
Temporary Buildings	•	•			•		•		•			10,000	• •
(iii) Main Canals and Bra	nches										3		
1. Survey of the comma	nded	area						•	•			67,500	67,500
2. Miscellaneous Survey	A.					•	•	•	•				5,000
3. Longitudinal Section	of the	river					•		•			2,500	
4. Soil Survoys	•										٠. ١	2,400	• •
(iv) Discharge and silt obser	rvatio	1							•			20,000	13,400
(v) Meteorological Observate	ione						•	•	•	•	•	2,000	••
(vi) Mineral Surveys							•		•			5,000	• •
(vii) Surveys for piecicultu	76					F 100	80a •		•	•	•	• •	1,000
(viii) Malaria Surveys					400	400	She"	5.	•	•		2,000	
(ix) Electric Load Surveys		•			62.5					•		••	10,000
(x) Economic and property	Surve	y <b>a</b>			TE					•	•	2,500	·2,500
(xi) Communications	•	•						g .	•			10,000	• •
(xii) Special Tools and pla	ni				196	ALC:			•		•	• •	60,000
(xili) Testing Apparatus a	nd lal	borator	y eq	uipm	ent				•			11,000	•
Contingencies	•	•	•	:	]				•	•	•	2,555	4,995
					A STATE OF THE STA						~~	1,57,075	2,19,895
II. TOOLS AND PLANT Tools and Plant					To be	THE STATE OF						1,43,820	• •
III. ESTABLISHMENT	•	•		·	100		- 75		•	•	•	1,33,105	1,33,105
		•			if s	GBAN	D Tor	AL			. –	4,34,000	3,53,000
											_		

(8d.) M. D. MITHAL,

Director Irrigation and Waterways

#### APPENDIX VII

#### C. P. AND BASTAR PROJECTS

Central Provinces and Berar together with Bastar State which has recently merged into this province are one of the richest provinces of India in minerals. There are vast deposits of coal, bauxite, iron, copper, manganese, limestone etc. etc. The quality of coal found, however, is rather inferior and on that account practically no industrial use of the mineral wealth of the tract has so far been attempted. Surveys for the prurpose of utilising the water resources of the area were undertaken about thirty years ago but the results were surprisingly disappointing. In the main it was brought out that in spite of the copious rainfall over the entire area the resources could not be utilised to produce cheap power or cater for much irrigation! At the request of the C. P. Government a fresh survey was undertaken by the CWINC and it was discovered that potential for power exceeded one million kW. and water could also be made available for perennial irrigation of nearly a million acres of cultivated and cultivable land.

In Bastar State at the request of the State Ministry a similar survey was carried out. This State has about the richest iron ore deposits concentrated in two small areas one on either side of the river Indravati. The percentage of iron in the ores is believed to be from 68 to 70. Potential of power on the Indravati river was found to be nearly 3,00,000 kW. continuous. The plateau of Jugdalpore was similarly discovered to be in a very undeveloped state, only a small portion being utilised for cultivation while actually cultivation could be extended over a much larger level and fertile area.

The possibilities of development were discussed with the Government of C. P & Berar and their technical officers and at a conference held in April, 1947 it was decided to select 8 projects besides those on the Narbada and Tapti for investigations with a view to prepare the detailed development estimates. C. P. Government also desired that the work of investigations should be done by the CWINC. The sites selected for investigations are given in the accompanying list in which other details of the projects are also shown. Similarly the projects for Bastar State have also to be investigated by CWINC. Details of the projects in that area are also shown in the list. The estimate amounting to Rs. 71,17,140 has been prepared to cover the cost of necessary work involved in the surveys and investigations. It is proposed to set up a Circle with three divisions and requisite number of sub-divisions, subordinate and ministerial staff to man the work of investigations. As in other programmes of investigations, survey works of dam sites, reservoir areas, areas to be commanded for irrigation will be completed through the agency of the Survey of India Department. Hydrological surveys and Geological surveys will be done in close co-operation with the Indian Meteorological Department and Geological Survey of India respectively. Provision has also been made for surveys for malaria control, fish cluture, navigation, soil-conservation etc. Provision for the acquistion of necessary plant for geological and hydrological and other surveys has been adequately made. The work is estimated to take four years to complete. The principal feature of the 12 projects 8 in C. P. and Berar and 4 in Bastar state are shown in accompanying statement.

Index map showing dam sites etc. is enclosed.

K. M. BHATIA,

Project Officer,
C. W. I. N. C.

ROUGH DATA FOR DAM SITEST

Minimum Irrigation power Poten- in connec- tial tion with acres other (Projects)	15 16	6,300 1,00,000	1,800 50,000	13,400 3,00,000	4,370 75,000	6,360 1,00,000	5,000 1,00,000	6,520 3,00,000	5,000 1,50,000	000 Very little	00 Very little	900 Very little	000'06'9 00
Minimum Minim power power (Projects) in co itself tion w kW. other (Proj	14	6,300	1,800	13,400 . 13	4,370 4	6,360 6	5,000 5,	6,520 6,	5,000 5,0	27,000 27,000	32,500 65,000	87,680 1,28,000	,400 22,000
<u>.</u> 8	13	15,870	15,488	35,200	24,000	48,000	20,000	16,448 6	28,000	61	32	1,54,000 87	64,000 14,400
Length Caps. Subme of water city in ged a spread million in at dam ac. ft. acres in cussad feet	12	662	.36	1.483	0.533	1.22	1.22	.893	1.22			8.75	2 -4
	11	11 · 12	8.745	2.97	6.765	4.455	.746	1.5	5.280			5.280	1.980
Approx. height of dam above bed of river in feet	10	125	7.5	120	116	100	112	120	77 6			160 5	100
R. L. Approx. of top of height of proposed dam dam above above bed of M.S.L. river in t	6	1,750	1,450	1,600	1,150	1,140	880	1,050	1,207			450	800
Catch- ment cares in 1 sq. miles	တ	1,416.8	1,377.28	1,596.8	1,726-72	1,196.8	1,227.2	3,000	1,133	5,000	7,347	16,312	2,744
Approx. distance from head in miles	7	122 miles on Kan-	han river. 100	. 252	2	ू इ	88	0 104	62			102	
which the dam & water Pspread Falls	80	55 0/5,1	55N/15 &	ro.	55, K/3,7	64H/14 & L/2:	4	64 J/11,10 104 64 J/11	64 M/6 64 N/6 7,10	<b>-</b>		65B/5 65 A/ 4,8	D/1,9,9.
Names of lates or wiprovinces in which dam and water spread fall	5	G. P.	C. P.	C. P. & B. little of Hydera-	C. P.	C. P.	C. P.	C. P.	C. P. & Eastern States.	Eastern	Eastern	C P. & Eastern	C. P. &
Longi- Names of tude and states or latitude provinces of left bank in which at dam site dam and water sp	4	79°16'E 21°43' N	80° E	77°22′ E 18°53′ N	78°5′E	81°59′ 80″ E	20°41' N 82°33'E 21°35' 30"	12′30″ 8′30″	N	81°43' E	海岸	ZE	81°52′ E
Name of Nearest village	3	North of Alkata,	North of	At Anti	East of	North of Nirai &	Mohera East of Uprani	North of Lotlota	At Satiara	Chitrakote	Barsur	Bhopalpat- nam.	Gumma
Name of tributary	2	Pench River .	2 Wainganga	Penganga river	4 Wardha river	Pairi river .	6 Jonk rizer .	7 Hasado	8 Mahanadi	9) Indravati river	odavari		sbari .
SI. No.	-	1 P	2	3 P	4 W	E P	6 Jc	7 H	8	9) In	Ę.		12 Sabari

### C. P. & BASTAR PROJECTS

Overall estimate for the preliminary surveys and investigations on 12 projects in the Central Provinces and Bastar State. (4 in upper Mahanadi basin, 4 in middle Godavari basin, and 4 in Bastar State).

I. WORKS				A.	BST H	ACT						
1. Dams and Appurtenant Works												Ra.
(A) Preliminary Expenses .												6,80,000
(K) Buildings	•	•	•	,	•	•	•	•	•	•	•	1,50,000
2. Main canals and branches .	•	•	•	•	•	•	•	•	•	•	•	10,60,000
3. Discharge observations .	•	•	•	•	•	•	•	•	•	·		3,10,000
4. Silt Observations	•	•	•	•	•	•	•	•	•	•	•	1,37,200
5. Property Burveys	•		•	•	•		•	•	·	•		28,800
6. Meteorological Surveys .	·	-		•	·	·	·	·	•	·		1,08,720
7. Geological Surveys	·			•		•	·	·	Ū	·		19,61,040
8. Communications	•	•	•	•	•	•	•	•	•	•		1,50,000
	•	•			·		•	. •	•	•		45,85,760
							90/	Conti	ngono	iua		92,000
					<u> </u>			AL W		108	•	46,77,760
II. TOOLS AND PLANT		16	7			3	101	AL W	UKKB	•		4,46,000
	•	- 3	-				•	•	•	•	• •	
III. ESTABLISHMENT	•	•					•	•	•	•	• •	19,93,380
			797				Tor	AL.	•	٠		71,17,140
Distribution—			1/	IN	J.							
1/3 debitable to upper Mahanadi	i basin		100		M.L			•	•			23,72.380
1/3 debitable to middle Godavari	basin		ibel!	77.0		h .				•		23,72,380
1/3 debitable to Bastar State pro	foots	• 1		1034 1024		7.	•	•	•	•	• •	28,72,380
Allotment required	let	year	2nd	year	3rd	year	4th	year				
	16,	52,000	project.	5,000	11011	00,000	17.0	000,000	,			
				DE	TAI	LS			٠			
I. WORKS												
1. Dam and Appurtenant Works												
(A) Preliminary expenses.												
(a) Surveys to be carried ou	t by S	urvey of	Indi	a.								
Reservoir Surveys												
Pairi	•	•	•	•	•	•	•	•	•		75	sq. miles
Jonk	•	•	•	•	•	•	•	•	•		78	do.
Hasado	•	•	•		•	•	•	•	•	÷ .	26	do.
Mahanadi	•	•	•		•	•	•	•	•		44	do.
Bhopalapatnam .	•	•	•		•	•	•	•	•		241	do.
Sabari	• .	•	•		•	•	•	•	•		100	do.
Chitrakot and Bargeur	•	•	•	•	••	•	•	•	•		300	do.
		•	•	•	•	•	•	•	•		25	do.
Pench											0 5	
Wainganga	•	•	•	•	•	•	•	•	•		25	do.
Wainganga Ponganga	:	•				•	:	•	•		55	do.
Wainganga	:	•	•	:	· ·	•		· ·	· ·			

1,007 sq. miles @ 375/- per sq. mil	le			•			•		Ra. 3,80,000
Surveys to be carried out by C.W.I.N.C.  Longitudinal Sections and other miscellaneoreservior, surveys, pisciculture, etc.	us so	urvey	s like	canal	alig	nment	surve	ys. s	
12 sites @ 25,000/- per site								• - • -,	
Gaspetor, Pot title		•	•	•	•	•	•	•	3,00,000
									6,80,000
(K) Buildings—									<del></del>
Temporary buildings-Lump Sum	•	• •	•	•		•			. 1,50,000
2. Main canals and branches			٠.						,,
Survey of irrigation area.									
18,75,000 scree @-/9/- per scre	•		•	•	•	•	•	•	10,60,000
<ol> <li>Discharge observations (No. of sites—12) (one at each pro Expenditure per sits</li> </ol>	>joct	site)							
l current meter @ 1,200/-								+	(non-recurring)
1 large boat @1,000/-	•	•	•	•	•	•	•	•	1,200
1 small boat @ 500/-	•	•	٠	•	•		•	•	1,000
1 set velocity rods @ 200/	•	•	•	•	•	•	•	•	800
1 set sounding rods @ 100/-	•	•	•	•	•	•	•	•	200
Ropes, etc.	•	•	•	•	•	•	•	•	100
Chronometers	•	•	•	•	•	•	•	•	200
Rack & pinion arrangement			•	•	•	•		•	200
Anchors					·	••	•	•	1,000
(b) Recurring	10	1	٠	·	·	•	•	•	
(b) Decurring		1	•	•	•	•	•	٠	5,000
l gauge reader @ 75/- for 4 years			•	•	•			•	3,600
1 Boatman @ 60/. p.m. for 4 years				•		•	•	•	2,880
6 Khalasies @ 50/. for 4 years	. 47	•	•	•	•	•	•	٠	14,400
5.0 047									20,880
									20,000
Total for one site		1	•	•	•	•	•	•	25,880
Total for 12 sites	15	1		•			•		8,10,000
4. Silt observations	g Hamisi Little								
(i) Equipment non-recurring @ 1,000/- per site	THE								12,000
(ii) 12 silt observers @ 100/- for 4 years .				•	•	•	•		57,600
(iii) 16 Khalasies for 4 years @ 50/- p.m	•				•	•		•	57,600
(iv) Miscellaneous on carriage and transport			•		·			•	10,000
•									
									1,37,200
5. Property Surveys.—									<b>* 600</b>
2 surveyors @ 100/- p.m. for 3 years .	•	•	•		٠.	•	•	•	7,200
12 khalasies @ 50/ p.m. for 3 years.	•	•	•	•	•	•	•	•	21,600
									28,800
R. Matagrafagical Surveyo	٠								
6 Meteorological Surveys. (a) Equipment non-recurring.									
60 new rain gauges @ 500/- each									30,000
(b) Recurring.	•	•	•	•	•	•	•	•	00,000
2 Meteorological Assistants @ 200/- for 4 yea	LIB								19,200
2 Senior observers @ 120/- for 4 years .			•	•	•	, • .	• .		11,520
60 part-time observers @ 16/- for 4 years		•				•	•		48,000
	m.	4-1 34	atos=	ologio	.) P				1,08,720
	1.0	NET 10	SV60L	orgon	er ioth	voys	•	•	1,00,720

(a) Hquipment non-recurring.													Rs.
8 Diamond Drills @ 75,000/				-	•	•	•	•		•	•		6,00,0
Diamonds and other spares	@ 40,	, <del>000</del> /- 1	dos. Tec	•	•	•	•	•		•	•		3,20,0
2 calyx drills 5"-6" complete	with	edaib	ment ar	id apa	TOB .	•	•		•	•	•		<b>50,</b> 0
8 special boats for drills @ 1	2,000/	- oach		•		•			•	•	•		16,0
Testing apparatus .	•	•	•		•	•		•	•	•	•		1,00,0
													10,86,0
(b) Recurring expenditure.													
(3 years operations are			nough).		•								
1 Geologist @ 800/- p.m. for			• •	•	•	•	•	•		•	•		28,8
3 Assistant Geologista @ 400			rs .	•	•	•	•	•		•	•		28,8
1 Drill foreman @ 1,000/- fo	or 8 y	6ars		•	•	•	•	•		•	•		26,0
8 Operators (1 per drill) @	150/-	for 3 y	BATE .	•	•	•	•		•	•	•		43,
48 helpers (6 per drill) @ 80	/- for	8 year			•	•	•	•		•	•		1,38,
Fuel and other expenditure	@ 20	,000/-	p.m. fo	r \$0 m	onths	•	•	•		•	•		6,00,0
													8,75,0
	for G	leologi	oal surv	oys	•	•	•	•	•	•	•	· —	19,61,0
6. Communications.  Lump Sum	•	•			•	•	•						1,50,0
Total of Works				71.								_	45,85,
	•	1000	Jag	ال	•	•	•	•	1	•	•		
2% Contingencies	•	133			7	•	•		•	•	•	_	92,
				GRAN	D TOTA	AL W	DREB	•		•		٠	46,77,
ZOOLS AND PLANT-													
(a) Camp equipment.		18	THE REAL PROPERTY.										
12 tonts 14' × 14' @ 1,200/- each .			1111			•						•	14,40
\$0 tonte 10' × 10' @ 800/- each				BL	•	•							14,0
30 shouldaries @ 600/- each .		400		145.71				•					18,0
30 servants tents @ 500/- cach .		(7)		III P	1	•							18,0
Camp furniture	•	150		- Labell		, ,							7,2
		6	ERUE I	न्य ने नय ने								-	78,6
b) Other tools and plant.				1 7 1									<u>_</u>
(f) Non-recurring.													
15 3/4 ton weapon carrier trucks @ 7	,000/	esch.					•	•		•	•		1,05,0
6 jeeps with trailers @ 7,000/- each													42,0
12-outboard motor @ 1,000/- each													12.0
48 levelling instruments 1,000/- eac	h												48,0
48 measuring chains @ 50/- each		•				•	•						2,4
48-100 ft. tapes @ 30/-each .													1,4
48-50 ft. tapes @ 20/- cach .		•					•	-		•			-,-
8 Theodolites @ 2,000/- each .													16,0
15 binoculars @ 300/- each				-	•	•	•	•		_		•	4,8
20 drawing boards @ 30/- each				•	•	•	•	-				•	4,0
20 plane tables @ 150/- each .				•	•	•	•	•		-		•	. 3,0
12 Prismatic compasses @ 150/- cach				•	•	•	•	•			-	•	1,8
	•	•		•	•	•	•	•		•	•	•	
TO DISTILLING MARKET NOT THE RESERVE	•	•	•	•	•	•	•	•		•	•	•	2,0
4 planimeters @ 500/- each 35 drawing instruments haves 2nd of	Ben 6	1 900	anel.										
35 drawing instruments boxes 2nd of Scales with off sets, French curves	laes (	200/-	each	•	. •	•	•	•		•	•	•	7,2 1,0

(ii) Recurring expenditure.											Re.
Repairs and carriage of scientific instrume			70aru	•	*	•	•	•	•	•	80;00
Running expenses for trucks and jeeps for	4 year	rs.	•	•	•	•	•	•	•	•	1,50,000
											2,00,00
	Total	(a)	<b>&amp;</b> (b)	Tools	and	Plant	•	•	•	•	4,46,00
ESTABLISHMENT. (Provision is for 4 years)											
1 Superintending Engineer @ 1850/- p.m.				•							88,80
3 Executive Engineers @ 800/- p.m. each		•	•	•	•	•	•	•	•		1,15,50
6 Assistant Executive Engineers @ 600/- p.m. 6 Assistant Engineers @ 500/- p.m. each	cech	•	••	•	•	•	•	•	•	•	1,72,80
1 Superintendent @ 300/- p.m		:	•	•	•	:	:	:	•	•	1,44,00 14,40
8 Head Clerks @ 200/- p.m. each	•	•	•	•	•	•	•	•	•	•	28,60
3 Accountants @ 200/- p.m. each 1 Stenographer @ 200/- p.m.	•	•	•	•	•	•	•	•	•	•	28,80
18 Upper Division Clerks including 8.D.Cs. @	1007- •	•	eneb	•	•	•	•	•	•	•	9,60
32 Lower Division Clerks @ 75/- p.m. each	100/- 1		. GECT	•	•	•	•	•	•	•	86,50
3 Steno-typists @ 100/- p.m. each	•	•	•	•	•	•	•	•	•	•	1,18,00
l Head Draftsman @ 300/- p.m.	•	•	•	•	•	•	•	•	•	•	14,40
•	•	•	•	•	• .	. •	•	•	•	•	14,40
8 Senior Draftsmen @ 160/- p.m. each	•	•	•	•	•	•	•	•	•	•	23,04
8 Draftemen @ 100/- p.m. each	•	•	•	•	٠	•	•	•	•	•	38,40
8 Tracers @ 75/- p.m. each	•	•	•	•	•	•	•	•	•	•	28,80
48 Overseers @ 150/· p.m. each	•	•	•	•	•	•	•	•	•	•	8,45,00
3 Sub-Assistant Surgeons @ 150/- p.m. each	17	•	بنرا	•	•	•	•	•	•	•	21,60
6 Research Assistants @ 180/- p.m. each		•	5.	), •	•	•	•	•	•	•	51,90
6 Laboratory Assistants @ 125/- p.m. each				7 .	•	•	•	•	٠	•	38,000
8 Compounders @ 75/- p.m. each			3 ( )		•	•	•	•			30,800
8 Ward boys @ 50/- p.m.		•		•			•	•		•	7,20
1 Jemsdar @ 40/. p.m		• (	145				••	•	•		1,920
28 peons @ 30/- p.m.	100	1	1								40,500
50 Barkandazes @ 30/- p.m.	Lilli	•									72,400
12 Daffadars @ 30/- p.m.											17,800
1 Daftri @ 40/- p.m		A j				•	•	•	•	•	1,920
					Tor	<b>AL</b>	•	•	•	. –	11,93,380
Dearness allowance and increments @ 25 %	(F)					•	•	•	٠		8,00,000
Travelling allowance		•		•		•		•			8,00,000
Establishment contingencies including office fur	niture	; ty	pewrit	ers et	c.	•	•	•	٠.	•	2,00,000
			m-4-	1 72.A.	1.11.L	ment				-	19,93,880

The 3rd May, 1948

(8di) K.M. BRATIA, Project Officer, U.W.I.N.O. Estimates for preliminary surveys and investigations in connection with projects for multipurpose development in C. P. and Bastar State prepared in accordance with the suggestions of the Ad-Hoc Committee.

### ABSTRACT.

. works—														
1. Dams and Appurtenant World	-													Rs.
(A) Preliminary expenses	~	_				_	_					_		5,24,000
(K) Buildings .	•	•	•	•	•	•		•	•	•	·	•	•	1,00,000
2. Main canals and branches	•	•	•	•	•	•	•	•	•	•	·	•	•	7,59,378
3. Discharge observations	•	•	•	•	•	•	•	•	•	•	•	•	•	1,65,280
4. Silt observations .	•	•	•	•	•	•	•	•	•	•	•	•	•	70,600
	•	•	•.	•	•	•	•	•	•	•	-	•	•	28,800
5. Property Surveys 6. Meteorological surveys	•	•	•	•	•	•	•	•	•	•	•	•	•	20,000 84,040
_	•	•	•	•	•	•	•	•	•	•	•	•	•	•
7. Geological Surveys . 8. Communications .	•	•	•	•	•	•	•	•	•	•	•	•	•	16,59,360
8. Communications .	•	•	•	•	•	•	•	•	•	•	•	•	٠.	1,00,000
														35,01,455
				٠				ngencie	98 .		•		•	70,029
•						То	TAL \	VORKS	•	•	•	•	•	35,71,484
II. TOOLS AND PLANT .														4,27,380
II. ESTABLISHMENT		•			-	40.								14,10,375
	•	•	•	Ch	12	all a	2	·	•		•	•		
			Ġ		Ų.		13			TOTAL	•	•	•	54,09,239
1/2 of above debitable to 4 of 1/2 of above debitable to 4 p  ALLOTMENT REQUIRED.	rojecti	sin F	Bastar	State	on 8	abari Ln	and I	indrava r <i>3rd</i>	ti (3 year	project	s) riv	ers.	:	27,04,620 27,04,620
					DΒ	TAIL	S							
. WORKS	.,			es.	of color	ald.	1							
1. Dams and Appurtenant Wor	E.													
(A) Preliminary expenses  (a) Surveys to be carrie	d out	by th	IO SILE	vev of	Indi	а.								
Reservoir surveys		<b>-</b> ,		,										
Pairi	•				•	•	•	•			,		75	sq. miles.
Jonk										,			78	do.
Hasado						•							26	do.
Mahanadi .													44	do.
Bhopalapatnam													241	do.
Sabari						•							100	do.
Chitrakot & Barast	1F		•	•	_						_		300	do.
<u></u>		·		Ť	•	•	•	•		• ,		•		(Approx.)
													864	do.
													002	uo.
45 G	86	4 sq.	miles	@ 37	5/- I	er sq.	. mile		•	•	•		B	ls. 8,24,000
(b) Surveys to be carrie		•			llana	OUE ***		, libe e-	mel.	alion				.i_l
Longitudinal Se sur veys, pis	cicuitu	re, et	·c.			ous st	ır veyi	a iika co	mgr :	eviRume	ıv Bü	rvey	, врес	
•	> BIVOS	(4) 2	v,UUU/	- per s	100	•	•	•	•	•	•	•	•	2,00,000
														5,24,00

(K) Buildings—											Rs.
Temporary buildings Lump Sum .											1,00,000
2. Main Canals and Branches — Survey of irrigation area.			•	•	·	·	•	·	·	·	1,00,000
13,50,000 acres @ -/9/- per acro		•	•	•	•	•					7,59,375
3. Discharge observations-											
Number of sites—8 (one at each dam site)											
Expenditure per site											
(a) Equipment non-recurring—											
I current meter @ 1200/											1,200
l large boat @ 1000/											1,000
l small boat @ 500/											500
l set velocity rods @ 200/											200
'l set sounding rods @ 100/											100
Ropes etc											600
Chronomoters											200
Rack and pinion arrangements .											200
Anchors	•	•			•						1,000
		, posterior	538%							-	5,000
(b) Recurring	1			1						_	
l gauge reader @ 75/- for 3 years .	53.			43					2.7	700	
1 Boatman @ 60/. for 3 years	1			de						160	
6 Khalasies @ 50/- for 3 years	- 6			<b></b>					10,		
	A			37			•				
·		VA.							15,6		
		tal for	mid fatter .	to.	•		•		20,	660	
	Fo	r 8 site	в .		٠	•	•	•	1,65,	280	
4. Silt observations—	40		a aiti								
(i) Equipment non-recurring @ 1000/- per	site										8,000
(ii) 8 Silt observers @ 100/- for 3 years .			= WT	4	·		•	•	•	•	
(iii) 16 khalasies @ 50/- for 3 years .		eleate.	9 9 9		•	•	•	•	•	•	28,800
(iv) Miscellaneous on Carriago & Transport	·		·	•	·	•	•	•	•	•	28,800
(10) 12:0001220020 02 03:000 00 1:02:00010	·	·	·	•	•	•	•	•	•	٠	5,000
											70,600
5. Property Surveys-										_	
2 surveyors @ 100/- p.m. for 3 years .											
	•	•	4	•	•	•	•	•	•	•	7,200
12 Khalasies @ 50/- p.m. for 3 years .	•	. •	•	•	•	•	•	•	•	٠_	21,600
											28,800
6. Meteorological Surveys—										_	
(a) Equipment non-recurring—				•							
50 new rain gauges @ 500/- each											0= 000
	•	•	•	•	•	•	•	•	•	•	25,000
(b) Recurring—											,
2 Meteorological Assistants @ 200/- for	-	rs .	•	•	•	•	٠,	•	•	•	14,400
2 Senior Observers @ 120/- for 3 years		•	•	•	•	•	•	•	•	•	8,640
50 part-time observers @ 20/- for 3 years	ars .	•	•	•	•	•	•	•	•	•	36,000
							•			-	84,040
										_	

### 7. Geological Surveys-

:•

(a) Equipment non-recurring—													Rs.
8 Diamond Drllis @ 75,000/- e	ach		•										6,00,000
Diamonds and other spares @	40,000	)/- p	er set				•		•		•		3,20,000
2 Calyx drills 5"-6" complete w	ith eq	uipı	nent a	nd sp	ares		•			•		•	80,000
8 special boats for drills @ 200	00/- ead	ch								•		•	16,000
Testing apparatus for rocks and	d rock	ma	terial		•			•		•			1,00,000
												-	10,86,000
(b) Recurring expenditure—												•	
1 Geologist @ 800/- for 2 year		•	•	•	•	•	•	•	•	•	•	•	19,200
2 Assistant Geologists @ 400/		-	rs .	•	•	•	•	•	•	•	•	•	19,200
l Drill Foreman @ 1000/- for 2	-		•	•	•	•	•	•	•	•	•	•	24,000
8 Operators (1 per drill) @150	•	-		•	•	•	•	•	•	•	•	•	28,800
48 helpers (6 per drill) @ 80/-		-		•	•	•	•	•	•	•	•	•	92,160
Fuel and other expenditure @	20,000	)/- p	.m. fo	r_20 z	nonth		•	•	•	•	•	• _	4,00,000
													5,83,360
Total for Geological surveys	•	•	•	•	•	•	•	•	•	•	•	•	16,89,380
8. Communications					1575.								1 00 000
Lump sum	•	•	Contract of the last of the la			٠.	•	•	•	•	•	٠.	1,00,000
			Carlo Day Street		or W	- V	•			•		•	84,11,815
			2 %	Conti	ngeno	los				•	•	•	70,236
		•	GRANZ	Tor	AL W	DEE	•	•	•	•	•	•	34,82,055
			Chin			l <sub>i</sub>						•	
TOOLS AND PLANT—			1										
(a) Camp equipage—			L	4									
8 tents 14'×14' @ 1200/- each	•	•	100			ik.	•	•	•	•	•	٠	9,600
20 tents 10'×10' @ 800/- cach	•	•	13.5		ally P		•	•	•	•	•	•	16,000
20 shouldaries @ 600/- each .	•	•	10000	11.			•	•	•	•	•	•	12,000
20 servants tents @ 500/- each	•			•				•				•	10,000
Camp furniture	•	•	16.3	1119			•	•	•	•	•	• _	4,800
(b) Other tools and plant—													52,400
(i) Non-recurring.						•							
15 3/4 ton weapon carrier trucks	_	00/-	each	•	•	•	•	•	•	•	•	•	1,05,000
6 jeeps with trailers @ 7,000/- eac		•	•	•	•	•	•	•	•	•	•	•	42,000
8 outboard motors @ 1,000/- each	1	•	•	•	•	•	•		•		•	•	8,000
32 levelling instruments @ 1,000/	- each	•	•	•	•	•	•	•		•	•	•	32,000
32 measuring chains @ 50/- each		•	•			•	٠.	•	•				1,600
32-100 ft. tapes @ 30/- each			•		•	•				•		•	960
32-50 ft. tapes @ 20/- each					•	•	•	•	•		•		640
6 Theodolites @ 2,000/- each							•	•				•	12,000
	•				•	•		•		•			3,000
10 binoculars @ 300/- each .					•	•					•		450
10 binoculars @ 300/- each . 15 drawing boards @ 30/- each	•	•					-	-	-	-	-	-	
15 drawing boards @ 30/- each	•		•		•		•	•			•		2,250
15 drawing boards @ 30/- each 15 plane tables @ 150/- each	each	•	•			•	•	•	•	•	•	•	2,250 1.800
15 drawing boards @ 30/- each 15 plane tables @ 150/- each 12 Prismatic compasses @ 150/- e	sach	•	•		•	•	•	•	•	•	•	•	1,800
15 drawing boards @ 30/- each 15 plane tables @ 150/- each 12 Prismatic compasses @ 150/- e 3 Planimeters @ 500/- each		• • • •	: :00/- e-		•	•	•	•	•	•	•	•	1,800 1,500
15 drawing boards @ 30/- each 15 plane tables @ 150/- each 12 Prismatic compasses @ 150/- e	class		:00/- ea		•	•	•	•	•	•	•	•	1,800

(ii) I courring expenditure.	int- f										** FA
Repairs and carriage of scientific instrum			ears	•	•.	•	•	•	•	•	\$7,50
Running expenses for trucks and jeeps for	2 Aes	ars	•	•	•	٠	•	•	•	•、_	1,12,500
											1,50,000
Total (a) and (b) Too	ls and	Plan	ŧ		•	•					4,19,000
2 % Contingencies	•	•	•	•	•						8,380
Grand Total Tools and Pl	ant	. •	•	•		•	•		•	٠ _	4,27,380
. ESTABLISHMENT											
(Provision for 3 years).											
l Superintending Engineer @ 1,850/- p.m.											68 800
2 Executive Engineers @ 800/- p.m.	•	•	•	•	•	•	•	•	•	•	66,600 57,600
4 Asstt. Executive Engineers @ 600/- p.m.	•	•	•	•	•	•	•	•	•	•	-
4 Asstt. Engineers @ 500/- p.m. each	•	•	•	•	•	•	•	•	•	٠.	86,400
1 Superintendent @ 300/- p.m	•	•	•	•	•	•	•	•	•	•	72,00
2 Head Clerks @ 200/- p.m. each	•	•	•	•	•	•	•	•	•	•	9,600
	•	•	• •	•	•	•	•	•		•	14,40
2 Accountants @ 200/- p.m. each	•	•	•	•	•	•	•	•	•	•	14,40
1 Stenographer @ 200/- p.m. each	1007	TR IT	-	•	•	•	•	•	•	•	7,200
13 Upper Division clerks including S.D. Cs. @	100/	р.ш.	Bacn		•	•	•	•	•	•	46,80
23 Lower Division clerks @ 75/- p.m. each	1.43			9.	•	•	•	•	•	•	62,10
2 Steno-typists @ 100/- p.m. each	11.18			•	•	•	•	•	•	•	7,20
1 Head Draftsman @ 300/- p.m.				•	•	•	•	•	•	•	9,60
2 Senior Draftsmen @ 100/- p.m. each	4.4		147	•	•	•	•	•	•	٠	11,52
6 Draftsmen @ 100/· p.m. each	1. 1			•	•	•	• ,	•	•	•	21,60
6 Tracers @ 75/- p.m. each	12	1.11	N.E.	•	•	•	•	•	•	•	16,20
32 Overseers @ 150/· p.m. each				٠	•	•	•	-	•	•	1,72,80
2 Sub-Asstt. Surgeons @ 150/- p.m. each .				•	• '	•	•	•	•	•	9,60
4 Research Asstt. @ 180/- p.m. each . ]	وامديا		1		•	•	•	•	•	•	25,92
4 Silt Analysts @ 180/- p.m. each	1		-	•	٠.	•	•	•	•	•	14,40
4 Laboratory Asstts. @ 125/- p.m. each .		मान् उ	1	•	•	•	٠	•	•	•	18,00
2 Compounders @ 75/- p.m. each	•	•		•		•	•	•	•	•	4,80
2 Ward boys @ 50/- p.m. each	•	•	•	•	•	•					3,60
1 Jemadar @ 40/- p.m	•	•	•					•			1,44
21 peons @ 30/- p.m. each		•	•				•	•			22,68
44 Barkandazes @ 30/- p.m. each	•	•	•	•	•	•	•				47,52
10 Daffadars @ 30/- p.m. each	•	•	•			•					10,80
1 Daftri @ 40/- p.m	•	•	•	•	•	•	-	•	•	•	1,44
										_	8,40,30
Dearness allowance @ 25%	•		•								2,10,07
Travelling allowance											1,80,00
Establishment contingencies including office	furnit	ure, t	ypewr.	iters,	etc.				٠.		1,80,00
				_	STABL					-	14,10,37

3-5-1948.

(Sd) K. M. BHATIA,

Project Officer, C. W. I. N. C.

#### APPENDIX VIII

#### REPORT

#### ASSAM PROJECTS REPORT

Assam, the easternmost Province of India, covers an area of 63,000 square miles and gets an annual precipitation of 286 million acre feet. It has tremendous water power potential and a vast scope for industrialisation from its mineral and forest wealths. It suffered a strategic strain during the last war and with partition has become still more important and therefore needs an industrial development all round.

The Province can roughly be divided into 2 main valleys, the Brahmaputra valley in the north and the Surma valley in the south. The waters of these rivers at present cause devastating floods, destroying crops, water logging lands and creating problems of soil erosion and denudation. At the instance of the Government of Assam, the Central Waterpower, Irrigation and Navigation Commission undertook a preliminary survey for multipurpose schemes to solve the above problems as well as to provide cheap power for industrialisation. The available data which is very meagre showed that 12 schemes, 3 in the Surma valley and 9 in the Brahmaputra valley could be mooted. Of these 4 schemes on the Barak and Someshwari rivers in the Surma valley and Dihang and Manas rivers in the Brahmaputra valley were entrusted for investigation to the Central Waterpower, Irrigation and Navigation Commission at a conference held by His Excellency the Governor of Assam in October 1947.

The Central Waterpower, Irrigation and Navigation Commission started investigations on these four schemes in January 1948, and two of the rivers Dihang and Barak have been inspected by an Engineer, Dihang having been inspected by a Geologist also. The inspection has shown that schemes on both the rivers are promising.

The four schemes are briefly described below in order of priority and their principal features are shown in the accompanying statement.

- 1. Dihang—It is the main tributary of the Brahmaputra and possesses 2 excellent storage sites within 13 miles of its debouch from the hills. A 500 feet dam will impound lake of 9.82 million acre feet and generate at least one million K. W. of continuous power. The scheme will provide for flood absorption by storing the supply of the main tributary at times of rain thereby releasing the capacity of Brahmaputra in the lower basin to absorb floods from other tributaries. The lake will be 70 miles long and help in opening up the tribal areas of Assam.
- 2. Barak—Barak rises in the hills of Manipur State, bifurcates into two estuaries the Surma and the Kusiyra, which both fall into the Meghna river. When Meghna is in floods, its back water effect interrupts drainage of the Surma Valley with the result that the plains of Catcher and Sylhet districts become almost one sheet of water. A storage scheme on this river would absorb floods thereby reclaiming the plains of Surma Valley from water-logging and will provide irrigation to the reclaimed areas as also generate about 2,90,000 K. W. of power, which can be used in industrial exploitation of the tremendous forest wealth of Manipur and Lushai hills. As these hills are of shalys formations, 3 alternate schemes as shown in the statement have to be investigated.
- 3. Manas—Manas is the largest tributary of the Brahmaputra at the western end of Assam. The river is snow cum rain fed and large icebergs are reported now and again to form artificial dams in the river and cause unexpected floods when any one of them gives way. A 400 feet high dam will solve this flood problem, generate 2,50,000 K. W. of continuous power and provide irrigation to the western areas of Assam. The Government of India have under consideration a project for a navigation canal between Ganges, Tista and Brahmaputra to provide water transport between Assam and West Bengal. The Manas project will shorten one of the links in the development of this canal as it will make Manas navigable throughout the year and the canal can be connected with Brahmaputra through Manas.
- 4. Someshwari—Someshwari river provides a site for power generation at the southern fringe of Gharo hills. The river has a catchment area of 803 square miles and a 340 ft. high dam will store the entire run-off. There are rich coal fields and purest limestone quarries near this site and the power generated is expected to help in the development of these industries.

To enable these 4 schemes to be put through, detailed investigations covering topographical surveys of reservoir areas, surveys for irrigation, hydrological surveys, meteorological observations, geological surveys, navigational surveys, soil conservation surveys and pisciculture surveys have to be undertaken. It is proposed to open up a Circle with 3 Divisions and 9 sub-divisions to carry out these investigations and complete them in a period of 3 years. Besides the civil staff, the geological staff and the meteorological staff have been provided and the total estimate for the investigations amounts to Rs. 50,00,000.

5. Index map showing dam sites, etc. is enclosed.

K. M. BHATIA, Project Officer, C. W. I. N. C.

3-5-1948.



ROUGH DATA FOR DAM SITES IN ASSAM PROVINCE

z. Tributary	Adme of Name of near- L Tributary est village I	Aame of Name of near- Longiude and Map in which Tributary est village Latitude of left dam and water bank of dam spread fall site		Approx. Maxication. Maxication man water area Level in sq. miles		App-rox. height of F.T. L. over river level in feet	Approx. length of water spread at M.W.L. at dam site in miles	Submer- ged area in acres		Approx. Capacity length of in m.a.ft. dam in feet	Average rain-fall for 11 years (Inches)	Run-off as per Inglis* formula (at 50%, M. a. ft.	Power potential K. W.
1 2	8	4	ις	9	7	. ∰ . ∞	6	10	. H	12	13	14	15
1 Dihang	Rengging	95°-14′-30″ E 28°-11′-30″ N	82/P.L.	89,600 1,000 470	1,000	470	89	000'09	1900	9.82	170.43	26.08	1,000,000
2 Manas	Matharguri	90°-56′-30″ E 26°-48′-30″ N	78/J.M.	11,300	1,000	400	34	64.700	1900	10.67	105.73	54.18	240,000
3 Someshwari	Masighat	<b>k</b> 2		1 008 1 1 1			29	33,200	2000	4.75	125.14	$\frac{31.86}{4.85}$	65,000
4 (I) Barak	Sibapurikhal		83 H/N.W. N.E.S.W.S.E.	4.800	500	440	129	89,690	4000	16.00	82.10	$\begin{array}{c} 2.67 \\ 17.9 \end{array}$	290,000
4(II) Barak	Bhubandhar	93°.12′.30″		<u> </u>								10.5	
4(III)A Barak	Bhubandhar	24°.41′.0″ N 93°.6′.0″ E	83/N.W.S.W.	5,270	400	340	108	94,000	4000	15.15	82.10	19.5	225,000
4/TTVB 41	Ē	24°-41′-0″ N		5,270	300	240	88	58,300	4000	7.19	82.10	11.6	116,000
4(III)C Irang	Ingmum Gallon	93°-0'-0' E 24°-41′-30" N 93°-15′-0" E	83 H/S.W.	1,475	450	up)	upto upper Dam 31 6,700	)am 6,700	2000	72.0	82.10	11.6	21,000
•		24°-30′-30″ N	N.W.	1,440	450	260	28	7,000	2000	0.93	82.10	3.22	21.000

\*Inglis formula is given as R".0. 85P"-12".

## Overall estimate for preliminary surveys and investigations for four projects in Assum

### ABSTRACT

	Pe	riod o	of inve	etiga	tion	•	•	•	•		•	. 3	yoars
Detailed estimates as prepare	bna be	submi	itted t	o W.	M. P.	for 1	5 mon	ths or	erati	ons-			
(Establishment provided for	12 to 1	l4 moi	nths)										23.08 lacs
Deduct non-recurring cost									•	•			10.3 lacs
													12.78 lacs
Assume 3 times this cost for	3 years	oper	at ions										38·4 lacs
Add non-recurring cost	•	•	•		•	•	•	•	•		•		10.3 lacs
										Tota Say	-		48.7 lacs 50 lacs

3-5-1948.

(Sd.) K. M. BHATIA,

Project Officer, C. W. I. N. C.

# Rough estimates of preliminary investigations of the Assam Projects for the years 1917-48 and 1948-49

														1947-48	1948-49
						ABS	TRAC	7 <b>T</b>	gy H					Rs.	Rs.
1.	Surveys by Survey of Ir	idia	Depo	artino	nt.			1						10,000	4,00,000
2.	Survoys by C. W. I. N. C	<b>.</b>	•			. 4					•		•	5,000	1,10,000
3.	Discharge observations (	4 si	tes)		•	4(7)	410	911	5			•	•	2,500	30,000
4.	Silt Observations			•						•	•		•	2,000	23,000
5.	Property Surveys .		•				4211		F .			•	•	••	10,000
6.	Meteorological Surveys													••	40,000
7.	Sciemological Surveys			•		•					•	•	•	••	20,000
8.	Geological investigations	,	•				•	•	•	•	•			••	8,00,000
9.	Communications .		•	•	•	•	•	•		•	•	•		••	25,000
10.	Temporary buildings		•	•	•	•		•	•	•	•	•	•	••	25,000
11.	Camp equipage .			•	•	•	•	•	•	•	•	•	•	20,000	10,000
12.	Tools and Plant .		•	•		•	•	•	•	•	•	•	•	1,00,000	80,000
13.	Establishment .		•	•	•		•	•	•	•	•	•		40,000	2 40,000
14.	Dearness allowance			•	•	•	•	•	•	•	•	•	•	16,000	96,000
15.	Travelling allowance				•	•	•	•		•	•	•	•	12,000	72,000
16.	Office contingencies	•	•	•	•	•		•	•	•	•	•		60,000	60,000
											Total			2,67,500	20,41,000

NEW BELRI; 18-11-47. MAN SINGH,
Director of Waterways, C.W.I.N.C.

## **DETAILS**

		Rs.	Rs
1. Surveys to be carried by Survey of India Department under direction of the C.W.	I.N.C.		
(a) Gorge sites 25 sq. miles at 110/- per sq. mile		2,750	••
River survey 1,000 sq. miles at Rs. 44/- per sq. mile		44,000	• •
Moving aircraft etc		3,250	••
(b) Surveys and map publications.—			,
Gorge sites 5,000 acres at Rs. 4/- per acre		20,000	
River Survey 900 sq. miles at Rs. 160 per sq. mile	•	1,44,000	••
	-		
	_	1,64,000	••
(c) Contoured surveys of Assam projects flood plain in Assam for Irrigation and protective measures, 3,48,000 acres at -/9/- per acre	other	1,96,000	4,10,000
<ol> <li>Survey to be carried out by or under direction of the C. W. I. NC.—</li> <li>(a) Longitudinal Sections of rivers and cross-sections, 650 miles at 150/- per mile</li> </ol>		07 200	
(b) Other miscellaneous surveys, e.g., canal alignment, special reservoir surveys, etc.		97,500 17,500	115.000
(v) Contra miscontaneous surveys, e.y., canar anginitem, special resolvent surveys, en	J.	17,500	115,000
III. Discharge observations.—			
Number of sites 4			
Expenditure per site. Equipment Non-recurring.—			
1 current meter at 1,200/-		1,200	
I boat large at 1,000/	•	1,000	
1 boat small @ 500/	•	500	
Velocity rods	•	200	
Sounding rods	. •	100	
Ropes, etc	•	600	
Chronometers	• -	200	
Recurring expenditure.—		3,800	
(Provision is made for 12 months)	_		
I supervisor @ 150/- p. m		1,800	•
I Boatman @ 40'- p. m	•	480	•
4 Khalasis (also suitable as Boatmen) @ 30/- p. m		1,440	
T. A., etc		605	
	_	4,325	
4 Sites equipment @ 3,800 per sito	•	15,200	
4 Sites recurring expenditure @ 4,325 per site	•	17,300	32,500
IV. Silt observations at the above 4 sites.—			
One silt observer and one analyst are proposed to be employed for taking observe at each site.	tions		
(i) Equipment non-recurring.—			•
Ammanatura A cata	•	4,000	4,000
Apparatus, 4 sets			
(ii) Recurring expenditure.—			
(ii) Recurring expenditure.—			
(ii) Recurring expenditure.—  (Provision is made for 12 months)	•	4,800	,
(ii) Recurring expenditure.—  (Provision is made for 12 months) 4 silt observers @ 100/- p. m. each	•	<b>4,</b> 800 <b>4,</b> 800	
(ii) Recurring expenditure.—  (Provision is made for 12 months)	•	=	

V. Property Surveys.—								÷÷	
								Rs.	
1 Supervisor for 12 months @ 110/- p. m.	•	•	•	•	•	•	•	1,320	
4 Surveyors for 12 months @ 80/- p. m.	•	•	•	•	•	•	•	3,800	
12 Khalasis for 12 months @ 30/- p. m	•	•	•	•	•	•	•	4,320	
Patwaris Lump Sum	•	•	•	•	•	h	•	560	
VI. Meteorological Surveys (Rain gauges and Snow cogauge stations.	•	It is	propo	sed to	insta	1 50 :	new		
<ul><li>(i) Equipment installation of gauges non-recurring—</li></ul>									
50 rain gauges (including temperature, 25,000 hr also some self recording gauges) average rate Miscellaneous apparatus snow samples etc.	umidity of say	and v 500/-	vind v each.	/elocit	y at 2	25 p	laces	25,000 <b>4,</b> 000	90 000
(ii) Recurring expenditure.—	•	•	•	•	•	•	•	<b>±,</b> 000	29,000
(Provision is made for 12 months									
1. Meteorological Assistant @ 200/								9.400	
· · · · · · · · · · · · · · · · · · ·	•	•	•	•	•	•	•	2,400	
1 Senior observer @ 120/- p. m	•	•	•	•	•	•	•	1,440	
16 Observers (part-time) @ 15/- p. m.	•	•	•	•	•	•	•	2,880	
16 Retainers (part-time) @ 12/- p. m	•	•	•	•	•	•	•	1,536	~
2 Snow surveyors @ $120/\cdot$ p. m	•		•	•	•	7	٠	2,880	Say 40,000
								40,136	40,000
WII Galamata ta 1 da a									
VII. Seismological Surveys.—  This will be taken up separately in consultation wiveys but a lump sum provision is made of Rs.  VIII. Geological Investigations.—			or of	Meteo	rolog	ical 8	Sur-		
(i) Equipment non-recurring—		in	L						
4 Diamond Drills with equipment complete @ 75	0001- 60	oh	3					3,00,000	
Diamonds (and other spares) for the above @ 40		59 4 " (A" ) T (S)	20	•	•	•	•	1,60,000	
1 Calyx Drill 5"—6" complete with equipment et	c.	CIL		•	•	•	•	20,000	•
Spares for above	37.0							5,000	
4 special boats for drills @ 2,000/- each .								8,000	
Testing apparatus for rocks and rock materials	ME	1						47,000	5,40,000
In the second	ALC: N	18.30	·	•	•	•	•	2.,000	0,20,000
(ii) Recurring expenditure.—			1					0.000	
1 Geologist @ 600/- p. m. for 15 months			-	•	•	•	•	9,000	
2 Asstt. Geologists @ 300/- each for 15 months	-	• /1	•	• •	•	•	•	9,000	
1 Drill Foreman @ 1,000/- p. m. for 12 months	File.	435	*	•	• 1	•	•	12,000	
4 Operators (1 per drill) @ 140/· p. m. each for 1		36	•	•	•	•	•	6,720	
24 Holpers (6 per drill) @ 80/- p, m. for 12 mont		•	•		•	•	•	23,040	say
Running expenses of 4 engines for drills for 10 me	onths @	5,00	$0/ \mathbf{P} $	: ill			•	2,00,000	2,60,000
132 Augustantia									
IX. Communications.—  Lump Sum	•		•		•	•	•	25,000	5,000
Lump Sum	_					_		25,000	25,000
•	•	•				-			,
XI. Camp equipage.—								4.000	
4 tents 14' × 14' @ 1,200/- each	•	4	•	•	•	•	•	4,800	
12 tents 10' × 10' @ 800/- each	•	•	•	•	•	•	•	9,600	
12 shouldaries @ 600/- each	•	•	•	•	•	•	•	7,200	
12 servants tents @ 500/- each	•	•		•	•		•	6,000	
Camp furniture	•	•	•	•	•	•	•	2,000	29,600
XII. Tools and plant.—				_					
(i) Non-recurring									
13 trucks @ 7,000/- each ,		•						91,000	
4 jeeps @ 7,000/- each				. ,			•	28,000	
4 country boats @ 1,000/- each		-				•		4,001	
4 Outboard motors @ 1,000/- each			•				,	4,000	
•									

8 Chronographs @ 100/- each											<b>Rs.</b>	
24 levelling instruments @ 1,000/-	each		•	•	•	•	•	•	•	•	<b>24,0</b> 00	
Measuring chains 24 @ 15/- each		•	•	•	•	•	•	•	• .	•	360	
26-100' tapes @ 30/- each .	•	•	•	•	•	•	•	• .	•	•	780	
30-50' tapes @ 20/- each .		•	· •	•	•	•	•	•	•	•	600	
4 Theodolites @ 1,200/- each		•	•	•	•	•	•	•	•	•	4,800	
6 Binoculars @ 200/- each .	•	•	. •	•	•	•	•	.*	•	•	· ·	
12 drawing instruments boxes 2nd	ologa /	• a or	)() (, aa	ah.	•	•	. •	•	•	•	1,700	
Scales with offsets, French ourve		<i>y</i> 210	oj- va	CII	•	•	•	•	•	•	2,400	
12 Drawing Boards @ 30 each	3	•	•	•	•	•	•	•	•	•	500	
12 Drawing Doards @ 30 each	•	•	•	•	•	•	•	•	•	• _	360	•
(ii) Recurring expenditure.—										_	1,84,000	
Repairs Working of trucks				•	•	•	•	:	•		4,000 12,000	
XIII. Establishment (Provision is made for 14 months).							-				,	
		1.									2	
3 Executive Engineers @ 600/-	_			•	•	•	•	•	•	•	25,000	•
9 Assistant Engineers S. D. Os. (	gy 3501	p. n	n. eaci	n	•	•		•	•	•	44,100	
1 Superintendent @ 250/- p. m.		•	•	•	•	•	•	•	•	•	3,500	
3 Head Clerks @ 160/- p. m. eac	<b>'</b> 1	•	•	•	•	•	•	•	•	•	6,720	
1 Stenographer @ 160/- p. m.	•	•	•	•	٠	•	•	•	•	•	2,240	
3 Accountants @ 150/p. m. each		•	•	-	100	•	•	•	•	•	6,300	
3 Upper grade clerks @ 80/- p. m			275			1	•	•	•	•	3,360	
3 Accounts clerks @ 80/- p. m. ca		• 6	57.8				•	•	•	•	3,360	
9 Sub-divisional clerks @ 80/ p. 1		1				15.	•	•			10,080	
3 Steno-typists @ 80/- p. m. each		•	554			2 ·			•		3,360	
4 Lower grade clerks @ 55/ p. m	. each		19.15			<i>y</i> .		•	٠.		3,080	
3 Record keepers @ 55/- p. m. ea	ıch			113			•	•			2,310	
6 Assistant Accounts clerks @ 5	5/• p n	ı. ea	ch	00	14.1						4,620	
9 Assistant Sub-divisional clerks	@ 55/-	р. 1	n, eac	h	PLAN.	. 4	•				6,930	
3 Assistant Record keepers @ 55	/- p. m	. eac	ch	The said		1	•	,			2,310	
2 Typists @ 55/. p. m. each .					1		,				2,310	
3 Despatchers @ 55/- p. m. each	•		1		- 15		,				2,310	
l Head draftsman @ 300/- p. m.			• 100	77	1897						4,200	
3 Senior draftsmen @ 170/- p. m.			. 11	40.00	1 7 1 4						7,140	
8 Draftsmen @ 100/- each .											11,200	
3 Overseers (Headqaurters) @ 10	0/- p. :	m. e	ach		·		·		·	·	4,200	
8 Tracers @ 60/- p. m. each								•	·	•	6,720	
36 Overseers @ 100/- p. m. each			•			•	·	•	•	•	50,400	
6 Research Assistants @ 160/- p.	m en	ch	•	•	•	•	•	•	•	•	•	
5 Silt Analysts @ 100/- p. m. eac		011	•	•	•	•	•	•	•	•	13,440 7,000	
3 Sub-Assistant Surgeons @ 100			.h	•	•	•	•	•	•	•	•	
3 Compounders @ 40/- p. m. eac		ı car	311	•	•	•	•	•	•	•	4,200	
3 Ward boys @ 30/- p. m. each	**	•	•	•	•	•	•	•	•	•	1,680	
l Jemadar @ 35/- p. m. each	•	•	•	•	•	•	•	•	•	•	1,260	
	•	•	•	•	•	•	•	•	•	•	490	
27 Peons @ 30 /- p. m. each 12 Dafadars @ 30/- p. m. each	•	•	•	•	•	•	•	•	•	•	11,340	
_ · · -	•	•	•	•	•	•	•	•	•	•	5,040	
24 Barkandazos @ 30/- p. m. each	1 .	•	•	•	•	•	•	•	•	•	10,800	
1 Daftri @ 35/- p. m	•	•	•	•	•	•	•	•	•	•	490	2,79,930
(b) Dearness and Travelling allowar	10es.	•									Say	2,80,000
Lump Sum	•	•	•	•	٠	•	•	•	•	•	1,96,000	1,96,000
Lump Sum	•	•	•	•	•	•	•	•		•	1,20,000	1,20,000

Estimate for preliminary surveys and investigations in connection with the projects in Assam Province prepared in accordance with the instructio of the AD-HOC Committee.

				AR:	STRA	107						-		
1. Surveys by Survey of India				AD,		101			,					6,16,500
2. Surveys by C. W. I. N. C.	•	•	•	•		•				•			•	1,50,000
3. Discharge observations		•			•	•	·	•				·		<b>57,76</b> 0
4. Silt Observations .										•		•		26,000
5. Property Survey .				•	•		•				•	•	•	9,600
6. Meteorological Survey					•			•					•	60,800
7. Seismological Survey					•			•						25,000
8. Geological Survey .						•								8,53,280
9. Communications Lump Sum	1				•	•			•	•	•		•	50,000
10. Buildings Lump Sum		•				•		•	•	•	•	•	•	50,000
11. Camp equipage .		•		•	٠	•			•	•				29,600
12. Tools and Plant .		•			•	•		•	•		•		•	2,80,170
13. Establishment .		•	•	•		•		,			•			8,65,000
											Total	•	•	30,73,710
			4	DI	ETA1	LS	-							
<ol> <li>Surveys to be carried out by Survey</li> </ol>	_		In a			LA	3							
(i) Air photography of gorge site (ii) River survey. 5 mile strip putra. 202×5=1,010											n with	Brah	ma-	5,000
Say 1,000 sq. miles @ Rs. 44 p	or s	q. mi	le	4007		THE								44,000
(iii) Moving aircraft	•			1.6	1						•			5,000
(b) Field Surveys and Publication	ne.—	_		10	3.4	Mr. Bar								
(i) Roservoir sites 20 sq. miles			T RO.	mile		77.	h .				_		_	75,000
(ii) River area 1,000 sq. miles	-	_	_	3 4 10			1	·	·	•		•	•	3,75,000
(iii) Irrigation potential on Mar	-	_	_	ter	-/9/-	per ac	re	·		•	•	•	•	1,12,500
(, 20		-,00,0	• • • • • • • • • • • • • • • • • • • •	112	Tia:	13.5		•	•	•	•	•	٠,	
						17 1								6,16,500
<ol> <li>Surveys to be carried out by C. W</li> <li>(a) Longitudinal sections of rive</li> </ol>				0 150 1	ner mi	ilo .								30,000
(b) Other miscellaneous surveys				-	-		ervoi	r. pisc	icultu	re. et	e.	Ť		1,20,000
(6) 00.001 12.0001.001.002	••••	•			,			-, <sub>F</sub>		,	••	·	Ĭ,	
														1,50,000
II. Discharge Observations— Number of sites 4 (2 for projects			4	Pa 1	11			P 17		3 6		"		
• •				or ny	grotog	ICSI GE	sus I	or E	Brak	BLDQ E	omegnv	Warı		
(a) Equipment expenditure non-re	ecum	ring—	•											
1 Current meter @ 1,200				•	•	•	•	•	•		•			1,200
1 Boat large @ 1,000 .	•	•			•		•	•	•	•	•	•	•	1,000
1 Boat small @ 500 .				•	•						•	•	•	500
1 Set sounding rods @ 100	•	•		•	•	•	•	•		•	•	•		100
Ropes, etc	•	•	•	•	•	•	•	•	•	•	•	•	•	600
Chronometers		•	•		•	•	•	•	•	•		•	•	200
Rack and Pinion arrangement	t	•	•	•	•	•	•	•	•	•	•	•	•	200
								,						4,000
•														*,000

1   Cauge reader @ 75 for 2 years   1,4     1   boatman @ 60 for 2 years   1,4     6   Khalasis @ 70 for 2 years   1,4     7   Total for one site   1,0     10,4	(b) Recurring—										
1   boakman @ 60 for 2 years   1,4     6   Khalasis @ 50 for 2 years   1,4     7   Total for one site   14,4     Total for 4 sites   57,7     1V. Siti Observations—   (i) Equipment non-recurring @ 1,000/- per site   4,0     (ii) 4   Site Observers and Analysts @ 100/- for 2 years   9,0     (iii) 3   Khalasis @ 50 /- 62 years   9,0     (iv) Miscellaneous on Carriage and Transport   2,3     20,0     V. Property Survey—   1 Survey or @ 100/- for 2 years   2,4     6   Khalasis @ 50 /- for 2 years   7,2     7   Surveyor @ 100/- for 2 years   7,2     9,6     VI. Meteorological Survey (rain gauges and enow courses)—   (i) 50 more rain gagese as proposed to be installed (in Barak & Someshwari) giving one gauge for 4,000     80, miles @ 500/-     Snow survey apparatus   7,5     1   Meteorological Assistant @ 200/- for 2 years   2,3     2   Senior observor @ 120/- for 2 years   2,3     3   Senior observor @ 120/- for 2 years   2,3     4   Senior observor @ 120/- for 2 years   2,5     5   Retainers (part-time)   7,6     6   Retainers (part-time)   16/- for 2 years   7,2     2   Snow surveyors @ 100/- for 2 years   7,2     5   California (part-time)   2,6     6   Retainers (part-time)   16/- for 2 years   7,2     6   Equipment non-recurring—   4 Diamond Drille @ 75,000/- each   5,000/- each   5,000/- each   5,000/- each   1,500/-	1 Gauge reader @ 75 for 2 years									•	1,800
10,4   Total for one site   14,4		•									1,440
10,4   Total for one site   14,4   Total for 4 sites   15,7   10,4   10,4   10,5   10,4   10,5   10,4   10,5   1	- ·		•								7,200
Total for 4 sites   57,7											10,440
Total for 4 sites   57,7					Total	for c	ne site			. –	14,400
(i) Equipment non-recurring @ 1,000/- per site (ii) 4 Silt observers and Analyste @ 100/- for 2 years 9,6 (iii) 8 Khalasia @ 50/- for 2 years 9,6 (iv) Miscellaneous on Carriage and Transport 2,3 28,00 V. Property Survey—  1 Surveyor @ 100/- for 2 years 2,4 6 Khalasia @ 50/- for 2 years 7,2 2,3 2,4 6 Khalasia @ 50/- for 2 years 7,2 2,4 6 Khalasia @ 50/- for 2 years 7,2 2,4 7,4 7,4 7,4 7,4 7,4 7,4 7,4 7,4 7,4 7									•	•	57,760
(ii) 4 Sitt observers and Analysts @ 100/- for 2 years 9,6 (iii) 3 Khalasis © 50/- for 2 years 9,6 (iv) Miscellancous on Carriage and Transport 22,6  V. Property Survey—  1 Surveyor @ 100/- for 2 years 7,2 6 Khalasis @ 50/- for 2 years 7,2 6 Khalasis @ 50/- for 2 years 7,2 7,4 6 Khalasis @ 50/- for 2 years 7,2 (i) 50 more rain gagues as proposed to be installed (in Barak & Someshwari) giving one gauge for 4,000 sq. miles @ 500/- Snow survey apparatus 7,5 (ii) Recurring expenditure— 1 Meteorological Assistant @ 200/- for 2 years 2,8 1 Senior observor @ 120/- for 2 years 2,8 1 Senior observor @ 120/- for 2 years 2,8 1 Senior observor @ 120/- for 2 years 2,8 1 Senior observor @ 150/- for 2 years 3,7 2 Snow surveyors @ 150/- for 2 years 3,7 2 Snow surveyors @ 150/- for 2 years 3,7 2 Snow surveyors @ 150/- for 2 years 3,7 2 Snow surveyors @ 150/- for 2 years 3,7 2 Snow surveyors @ 150/- for 2 years 3,7 2 Snow surveyors @ 150/- for 2 years 3,7 2 Snow surveyors @ 150/- for 2 years 3,7 2 Snow surveyors @ 150/- for 2 years 3,7 2 Snow surveyors @ 150/- for 2 years 3,7 2 Snow surveyors @ 150/- for 2 years 3,0,0,0 Diamonds and other sparse @ 40,000/- per set 3,0,0,0 Diamonds and other sparse @ 40,000/- per set 3,0,0,0 Testing apparatus for cooks and rook material 5,40,0,0  Testing apparatus for rooks and rook material 5,40,0,0 (ii) Recurring expenditure— 1 Geologist @ 900/- for 2 years 3,0,0,0 1 Drill Foreman @ 1,000/- for 2 years 4,0,0,0,0 1 Drill Foreman @ 1,000/- for 2 years 4,0,0,0,0 1 Drill Foreman @ 1,000/- for 2 years 4,0,0,0,0 1 Drill Foreman @ 1,000/- for 2 years 4,0,0,0,0 1 Prel and other running expenses @ 10,000 p. m. per drill for 20 months 2,0,0,0  Fuel and other running expenses @ 10,000 p. m. per drill for 20 months 3,13,2											
(iii) 8 Khalasis @ 50/- for 2 years 9,8 (iv) Miscollaneous on Carriage and Transport 2,3  28,0  V. Property Survey—  1 Surveyor @ 100/- for 2 years 2,4 6 Khalasis @ 50/- for 2 years 2,4 6 Khalasis @ 50/- for 2 years 3,7,2  7.1. Meteorological Survey (rain gauges and snow courses)— (i) 50 more rain gagues as proposed to be installed (in Barak & Someshwari) giving one gauge for 4,000 sq. miles @ 500/- Snow survey apparatus .  (ii) Recurring expenditure—  1 Meteorological Assistant @ 200/- for 2 years 2,3 1 Senior observor @ 120/- for 2 years 4,8 16 Observors @ 20/- for 2 years 4,8 16 Observors @ 20/- for 2 years 4,8 16 Observors @ 20/- for 2 years 5,7 2 Snow surveyors @ 150/- for 2 years 5,7 2 Snow surveyors @ 150/- for 2 years 5,7 2 Snow surveyors @ 150/- for 2 years 5,7 2 Snow surveyors @ 150/- for 2 years 5,7  ///////////////////////////////////		•	•	•	•	٠	•	•	•	•	4,000
(iv) Miscellaneous on Carriage and Transport	• • • • • • • • • • • • • • • • • • • •	irs .	•	•	•	•	•	•	•	•	9,600
V. Property Survey—   1 Surveyor @ 100/- for 2 years   2,4   6 Khalasis @ 50/- for 2 years   7,2   7.2   9,8     I. Meteorological Survey (rain gauges and enow courses)—   (i) 50 more rain gagues as proposed to be installed (in Barak & Someshwari) giving one gauge for 4,000   25,00   sq. miles @ 500/- sq. miles @ 5	· · · · · · · · · · · · · · · · · · ·	•	•	•	•	•	•	•	•	•	9,600
1   Surveyor @ 100 - for 2 years   2,4	(iv) Miscellaneous on Carriage and Transport	•	•	•	•	•	•	•	•	,	2,800
1   Surveyor @ 100 - for 2 years   2,4     6   Khalasis @ 50 - for 2 years   7,2     7,2     7,2     7,2     7,2     7,2     7,3     7,4     7,2     7,2     7,3     7,4     7,5     7,6     7,6     7,6     7,6     7,6     7,6     7,6     7,6     8,6     8,6     8,6     8,6     9,6     1,6										_	26,000
7.2	V. Property Survey—										
9,8	1 Surveyor @ 100/- for 2 years	•	•	•		•	•	٠	•	•	2,400
Meteorological Survey (rain gauges and enow courses)	6 Khalasis @ 50/- for 2 years . , .	•	•	•	•	•	•	•	•	•	7,200
(i) 50 more rain gagues as proposed to be installed (in Barak & Someshwari) giving one gauge for 4,000 sq. miles @ 500/- Snow survey apparatus	• <del>6</del>										9,600
(i) 50 more rain gagues as proposed to be installed (in Barak & Someshwari) giving one gauge for 4,000 sq. miles @ 500/- Snow survey apparatus	UT Meteorological Survey (rain aguage and enous courses)	\								~~	
sq. miles @ 500/- Snow survey apparatus	• • • • • • • • • • • • • • • • • • • •	-	Jr & S	nme	hwari\ o	ivin	a one as	11106	for	4 000	
(ii) Recurring expenditure—  1 Meteorological Assistant @ 200/- for 2 years		17:00									25,000
1 Meteorological Assistant @ 200/- for 2 years	Snow survey apparatus		15.	1.			•			•	7,500
1 Meteorological Assistant @ 200/- for 2 years	(ii) Recurring expenditure—			7							
1 Senior observor @ 120/- for 2 years											4,800
16 Observers @ 20/- for 2 years (part-time)   7,6     16 Retainers (part-time) @ 15/- for 2 years   5,7     2 Snow surveyors @ 150/- for 2 years   7,2     50,3     711. Seismological Survey—			Pojr								2,880
16 Retainers (part-time) @ 15/- for 2 years 5.77 2 Snow surveyors @ 150/- for 2 years 7.28 60,38  VII. Seismological Survey—  Lump Sum 25,00  VIII. Geological Survey—  (i) Equipment non-recurring—  4 Diamond Drills @ 75,000/- each 3,00,0 Diamonds and other spares @ 40,000/- per set 1,60,0 1 Calyx drill 6"—6" complete with equipment and spares 25,0 4 Special boats for drills @ 2,000/- each 3,00 Testing apparatus for rocks and rock material 47,00  (ii) Recurring expenditure—  1 Geologist @ 800/- for 2 years 1,9,00 1 Drill Foreman @ 1,000/- for 2 years 2,4,00 4 Operators (1 per drill) @ 150/- for 2 years 1,4,44 24 Helpers (6 per drill) @ 30/- for two years 4,000 Fuel and other running expenses @ 10,000 p. m. per drill for 20 months 2,00,000  3,13,2	to the second se		TH								7,680
2 Snow surveyors @ 150/- for 2 years		1111	11.1								5,760
Color   Colo		Section 19	4.5								7,200
No.   Seismological Survey	6.3	1700	No.								
Lump Sum	Viete										00,820
(i) Equipment non-recurring—  4 Diamond Drills @ 75,000/- each	VII, Seismological Survey—										
(i) Equipment non-recurring—  4 Diamond Drills @ 75,000/- each	Lump Sum		<b>535</b>		•	•	•	•	•	•	25,000
4 Diamond Drills @ 75,000/- each	VIII. Geological Survey—										
Diamonds and other spares @ 40,000/- per set	(i) Equipment non-recurring—										
1 Calyx drill 5"—6" complete with equipment and spares	4 Diamond Drills @ 75,000/- each	•	•		•	•		•	•		<b>3,00,</b> 000
4 Special boats for drills @ 2,000/- each	Diamonds and other spares @ 40,000/- per set .	•	•	•	•	•	•		•	•	1,60,000
Testing apparatus for rocks and rock material	1 Calyx drill 5"—6" complete with equipment an	d spare	8 .		•					•	25,000
(ii) Recurring expenditure—         1 Geologist @ 800/- for 2 years	4 Special boats for drills @ 2,000/- each				•		•		•		8,000
(ii) Recurring expenditure—       1 Geologist @ 800/- for 2 years	Testing apparatus for rocks and rock material	•	•		•	•	•	•	•	•	47,000
1 Geologist @ 800/- for 2 years										_	5,40,000
1 Asstt. Geologist @ 400/- for 2 years	(ii) Recurring expenditure—										···
1 Drill Foreman @ 1,000/- for 2 years	1 Geologist @ 800/- for 2 years	•		•	•	•	•		•	•	19,200
4 Operators (1 per drill) @ 150/- for 2 years		•	•	•	•	•	•	•	•	•	<b>₹9,600</b>
24 Helpers (6 per drill) @ 80/- for two years		•	•	•	•	•	•	•	•	•	24,000
Fuel and other running expenses @ 10,000 p. m. per drill for 20 months		•	•		•	•	•		•	•	14,400
3,13,2		•	•	•	•	•	•	•	•	•	46,080
	Fuel and other running expenses @ 10,000 p. m. r	er drill	for 20	moi	nths	•	•	•	•	•	2,00,000
'Folat . 8.53.2'											3,13,280
friction to advisory							Total				8,53,280

ΤX	Communications—													
11	Lump Sum											,		[50,000]
													•	
X.	Temporary buildings—													50,000
	Lump Sum	• •	•	•	•	•	•	•	•	•	•	•	٠.	
XI.	Comp equipage-													
	4 tents 14'×14' @ 1,200/- each		•	•	•	•	•	•	•	•	•	•	•	4,800
	12 tents $10' \times 10'$ @ 800/- each		•	•	•	•	•	•	•	•	,	•	•	9,600
	12 shouldaries @ 600/- each .		•	•	•	•	•	•	•	•	•	•	•	7,200
	12 servants tents @ 500/- each				•	•	•	•	•	•	•	•	•	6,000
	Camp furniture .	• •	ŧ	•	•	•	•	ŧ	•	•	•	•	• •	2,000
														29,600
ΧI														
	(i) Non-recurring—													01.000
	13 trucks @ 7,000/- each .		•	•	•	•	•	•	•	•	•	•	•	91,000
	4 jeeps @ 7,000/- each .		•	•	•	•	•	•	•	•	•	•	•	28,000
	4 outboard motors @ 2,000/-		•	•	•	•	•	•	•	•	•	•	•	8,000
	24 levelling instruments @ 1,000	•	•	•	• 1	•	•	•	•	•	•	•	•	24,000
	24 measuring chains @ 15/- each		•	•	•	•	•	•	•	•	•	•	•	360
	24 metallic tapes @ 30/. each						•	•	•	•	•	•	•	720
	4 Theodolites @ 2,000/- each		•	179	13.6	100	,	•	•	•	•	•	•	8,000
	8 Binoculars @ 300/- each		. 6				35	•	•	•	•	•	•	2,400
	18 Drawing boards @ 30/- each	•		4	201			•	•	٠	•	•	•	540
	18 drawing instruments 2nd siz	o @ 200/	- each	ı Gilli			•	•	•	•	•	•	•	3,600
	3 planimeters @ 500/- each			1			•	•	•	•	•	•	,	1,500
	15 plane tables @ 150/- each	•	•	1	177		•	•	•	,	•	•	•	2,250
	12 nos. Prismatic compasses @	150/- eac	h 👝	1.0	13.1	1.3		•	•	•	•		•	1,800
	Other miscellaneous drawing appe	aratus lil	te set	squar	es, sc	ales, c	urves	•	•	•	•	•	٠.	8,000
				Bill	iio:	172	3							1,80,170
				(internal	W. 2		ř.						_	
	(ii) Recurring expenditure-					happed in								
	Repairs and carriage of scientif	le instrur	nents	for 2	yea18		•	•	•	•	•	•	•	25,000
	Running expenses for trucks an	d jeeps f	or 2	years		•	•	•	•	,	•	•	•	75,000
													_	1,00,000
											Tot	al		2,80,170
													-	
XII	I. Establishment— (1) Provision for 24 months													
	1 Superintending Engineer @ 1	850/. for	r 24 n	onthe							•		•	44,400
	2 Executive Engineers @ 800/			100110120	•						•			38,400
	6 Assistant Engineers @ 400/.			•										57,600
	0.1 0.0	p. m. 00 30	0/- n	m.	•			·			•		•	7,200
	1 Superintendent for Circle Off 1 Head Draftsman for Circle O				•	•	•							7,200
	1 Stenographer for Circle Office					•		•		•	•		•	4,800
	2 Head Clerks for Executive Er	wineers'	Uthoo	. (A)				·					•	9,600
	2 Accountants for Executive En	remeers,	Office	യെ	00/- p	. m. s	ach	•	•		•		•	9,600
	2 Accountants for Executive El 13 Upper grade clerks including	Sur 4:	rieinn	al clari	ka ພ ••••••••••••••••••••••••••••••••••••	100/-	each							31,200
	15 Upper grade cierks including	/ID·UDG coning/	(121017)	10/- 22 THE CTOIL	m es	ch					•		•	4,800
	2 Stenographers to Executive E	mgmeers	CO IL	ord or-p.	su. Ob	~ . ~ .	5 n. n	n. 880	h.					41,400
	23 Lower grade clerks including		nochoc:	*.	-7 Fig.	. w '	- P. I				•	•	•	14,400
15	6 Draftsmen @ 100/- p. m. each M. of I. & P.		•	•	•	•	•	•	-	*		•	1	

6 Tracers @ 75/- p. m. each .															10,800
24 Overseers @ 150/- p. m. each															86,400
4 Research Assistants @ 200/- p. 1	m.	0BC	h .												19,200
4 Laboratory Assistants @ 75/- p	. n	1. <del>0</del>	ach												7,200
2 Sub-Assistant Surgeons @ 150/-	<b>.</b> p.	m	. eac	h.											7,200
3 Compounders @ 50/- p. m. each														٠.	3,600
2 Ward boys @ 50/- p. m. each															2,400
1 Steno to Geologist @ 100/- p. m.															2,400
1 Clerk to Goologist @ 75/- p. m.															1,800
3 Draftaris @ 40/- p. m. each .															2,880
1 Jemadar to S. E. @ 40/- p. m.															960
21 Peons (8 per Division = 16) Circle Office—3 Geologist and Assistant —2	}	@	30/-	р. 1	n. e	ach									15,120
36 Barkandazes @ 30/- p. m. each	٠.														25,920
10 dafadars @ 30/- p. m. each									•						7,200
														-	4,71,360
													Say	• -	4,72,000
Dearness allowance @ 25 % .															1,18,000
Travelling allowance				-											1,50,000
Establishment contingencies includi	ng	off	ice f	arni	ure	typ	ewrit	ers, e	to.						1,25,000
				, 2	3	10	E	04		m-t.	.) TO.4	-1.1:.:	hment	-	P 6 8 000
				430	10	E	55	100		TOT	สา ธาลก	P D118	nment	_	8,65,000

सक्यपंच जवने

(Sd.) K. M. BHATIA,

Project Officer, C.W.I.N.C.
3-5-1948

#### APPENDIX 1X

#### COORG PROJECT REPORT

The province of Coorg is a small centrally administered area in South India, west of Mysore State. The total area is 1,582 square miles and population of less than 2,00,000. It receives an annual rainfall of about 125". A number of schemes for irrigation and hydro-electric generation were projected by the provincial engineers in the past, but all of them were shelved for one reason or another. A small province like Coorg cannot take up independently investigations, preparation, and execution of such large scale projects for the development of its water and power resources.

C. W. I. N. C. was, therefore, approached by the Chief Commissioner of Coorg to take up the investigations of the feasible projects in the province, and also to take up the question of renovation of existing irrigation and fish culture tanks. Director, Irrigation and Assistant Director toured Coorg in October last, and inspected most of the sites. As a result of the inspection, the three projects—Herangi, Barapole and Lakshmantirtha, were considered suitable for investigations. Main features of these projects are given below (See Index Map).

Herangi Project—This project was first conceived in 1877 on representation of an influential zamindar of the place who drew attention to the possibility of utilising the Herangi river as a source of irrigation. A scheme prepared in 1899 for an anicut across Herangi near Herur village was later on abandoned as it was considered unremunerative. Similar attempts at reviving the project were also unsuccessful and the scheme was later on shelved. In order to make it a paying project, a dam with possibility of hydel energy along with irrigation is envisaged. A suitable site near the boundary of Herangi and Halgunda villages in the narrow gorge has now been located and is considered suitable for about 100' high dam. It would be affording irrigation to about 7,000 acres and generate about 1,800 kW. of continuous power.

Barapole Project—This project envisages two dams about 100'—150' high, one each on Konganahole and Kokatahole, the two tributaries of the Barapole river, and through pipes leading the discharge about 4 miles away, so that a head of about 1,500' is available for power. The total power available from these two dams is estimated to be about 47,700 kW. of firm power. The power can be utilised in Madras Presidency for the adjoining districts of Malabar and South Kanara which are in need of it. It will also give impetus to new industries being started in Coorg province itself.

Lakshmantirtha Project—This project originally prepared in 1941 consists in having an anicut across Lakshmantirtha river just below its confluence with Ramtirthahole. The anicut will supplement water required to irrigate about 3,000 acres in Coorg province. The execution of the project was however objected to by the Mysore Government as in their view it would have had detrimental effect on the existing irrigation lower down the river in Mysore territory. To speed up agreement it is proposed to hold a meeting of the engineering representatives of the C.W.I.N.C., Madras Government and Mysore Government to go into the question whether it would be possible to allow the construction of an anicut, or it would be necessary to provide storage at the site. Survey and investigation work will have to be done for either project.

An overall estimate of Rs. 6,64,700 has been framed to carry out the surveys and investigations work on all the three projects and to put up proposals for renovation of irrigation tanks. Surveys of the reservoir areas and dam sites provided in the estimate are proposed to be carried out by the Survey of India Department, whereas the surveys for the irrigation areas would be done by the C.W.I.N.C. staff. Property surveys, electric load surveys and mineral surveys have also been included in the estimate. Geological investigations, including boring and drilling in the abutments and foundation, are proposed to be carried out in conjunction with the Geological Department and have been adequately provided for in the estimate. Fixing of new rain gauges, temperature and humidity recording stations shall be set up and read by the Meteorological Department. Discharge and silt observations are porposed to be recorded regularly and have been provided for in the estimate. To carry out these investigations it is proposed to open one division with three sub-divisions along with the requisite staff for two years, the time which it is estimated the work will take to complete. Necessary provision for this has been made in the estimate. Provision has also been made for the purchase of necessary office equipment, scientific and ordinary tools and plant, and motor vehicles, etc. It is also proposed to house the entire staff in temporary buildings for the duration of the investigations.

M. D. MITHAL,
Director, Irrigation and Waterways,
O. W. I. N. C.

Overall estimate for preliminary surveys and investigations of Irrigation and Hydel Projects in the Coorg Province.

									_							
						A	BST.	RAC:	T							D.
I. WORKS																Rs;
II. TOOLS AND PLANT	,	•		•	,	•	•	•	•	•	•	•	,	•		2,11,260
III. ESTABLISHMENT	•	•		•	•	•	•	•	•	•	•	•	•	•		1,14,240 [3,39,240
III. MOIADLISHMENI	•	•	•	•	•	•	•	•	•	•	•		•	•		,0,38,240
													Tota	1 .		664,740
							5 E/A	4770	,					• •		
WORKS—						4	DET.	1116								
(i) Dams and Appurtenant Preliminary Expenses:-		rks														
1. Survey of the reserve intervals on a scale					hotog	raph	y and	groun	d su	rvey a	ınd pl	otting	conto	urs @	<u>)</u> 10'—	5,
10 sq. miles 2. Survey of the Dam s scale of 32"=1 mi	ites .	s. 37	75/∙ <b>wei</b> i	per : r site	sq. m by	ilo air p	hotogi	aphy	and	grour	nd sur	veys s	nd pl	otting	y on a	3,750
1,280 acres (		3. 4/-	per	801	9		•									5,120
<ol> <li>Geological investigati drifts, etc.</li> </ol>			-			the d	lams a	nd we	ir ai	tes inc	eluding	g borii	ng, co	re dri	lling,	·
Kokatahole dam					•		4.5	38°•		1	5 Nos					
Konganahole dam		•		•		1	The last	Aller .	1	1	5 Nos					
Herangi dam						Call.			4	1	5 Nos					
Lakshmantirtha wei	r	•		•	•						Nos,					
						16				5	0 Nos	•				
50 Nos. each of	50'-	2500	ft.	3 R	s. 20/	- per	foot	4				•	•		•	50,000
Soil Analysis	for e	earth	nen i	dam	etc.		144	KW.		•						2,000
(ii) Buildings:						450	1	Plak:	27							
Temporary Building (iii) Main Canals and Br	z∎ anch∈	es :		•	٠		FILE OF			•	٠	•	٠	•	•	5,000
1. Surveys of the comme	ande	d are	985	for a	lignn	aent e	of can	als:								
Herangi	•	٠		•	٠			व देवरा			0 acre					
Lakshmantirtha		•		•	•	. "	1.4.4	4 114	٦.	3,00	00 acre	38				
									•	10,00	00 acre	×8				
10,000 acres @	a 1/2	2/- in€	ราก	e <b>re</b>			•									11,250
2. Miscellaneous surveys	В					:.				:			·	:	:	4,000
3. Longitudinal section				s an	d its	tribu	taries	40 m	les (	⊉¦Rs.	25/ p	er mil	е		•	1,000
(iv) Discharge and Silt ob One boatman and	eervo a Ki	ation. halas	đ Lia u	t ma	ch di	achar	an site	·	of r	onde	digaha		a. a		ata ir	لماساما
One bottimen and	3 sit	ee (a)	Re	5,0	00/-	per si	te per	yoar	for 2	years	3	. Ro 10	Jus, 11	Ua.10,	•10. 11	30,000
(v) Meteorological Observa	tione	94														,,,,,
Raingauges, temperat	ure,	hum	idit	y, et	c. ob	serva.	tions	•		L.S.	•	•	•	•	•	2,000
(vi) Mineral Surveys (vii) Electric load surveys	•	•		•	•	•	•	•		L.S. L.S.	•	•	•	•	•	2,000 10,000
(viti) Eco nomic and Prope	riy s	urve	ys		•		•			L.S.	·	·	•	·	•	5,000
(vx) Communications (x) Special tools and plan	J.			•	•	•	•	•	•	L.S.	•	•	•	•	•	5,000
1. Dia mond drill o		lete :	wit.	h ann	MARIANT	ies G	Ra. f	000	ench	١.						60,000
Testing apparatus							•	•	•	•	:	:	:	:	:	11,000
															-	2,07,120
	20	% co	nti	ngen	oles		,				•					4,140
															-	2,11,260
	To	ial V	Vori	kg .											-	2,11,260
	_	•			-	-	-	-	-	-	-	-	•	•	•	-,,

II. TOOLS AND PLANT										
<ol> <li>Motor vehicles for survey parties 6 Vehicles @ I Maintenance for 2 years</li> </ol>	Ks. 7,0	00 ва	ch.	•	•	٠	•	•	•	Rs.
2. Scientific instruments etc.	•	•	•	•	•	•	•	•	•	20,000
3. Ordinary tools and plant	•	•	•	•	•	•	•	•	•	10,000
•	•	•	•	•	•	•	•	•	•	5,000
4. Camp Equipage 5. Office furniture	•	•	•	•	•	•	•	•	•	15,000
6. R & C of T & P	•	•	•	•	•	•	•	•	•	15,000
o. R&Coll&P	•	٠	•	•	•	•	•	•	·	5,000
2% contingencies	• ·	•		•	•			•	•	1,12,000 2,240
. Total Tools and Plant	_	_								1,14,240
III. ESTABLISHMENT	•	•	•	•	•	•	•	•	•	1,14,240
1. Pay of Officers										
Executive Engineer 1 No. @ Rs. 875/- p.m. for 2						_				
Assistant Engineer 3 Nos. @ Rs. 560/- p.m. for 2	years	•	٠	•	•	•	•	•	•	21,000
Assistant Geologist @ Rs. 500/- p.m. for 2 years		•	•	٠	•	•	٠	٠	•	40,320
Drill foreman @ Rs. 1,000/- p. m. for 1 year	•	•	•.	•	•	•	•	•	•	12,000
Diffi foreman @ 148. 1,000/- p. m. for 1 year	•	•	•	•	•	•	•	•	•	12,000
									Rs	85,320
2. Pay of Establishment.		30,								
Supervisors 12 Nos. @ Rs. 240/• p.m. for 2 years		5/15	2	•	٠	•	•	•	•	69,120
Accountant 1 No. @ Rs. 200/- p.m. for 2 years				•	•	•	•	•	•	4,800
Head Clerk 1 No. @ Rs. 180/- p.m. for 2 years	/台次			•	•	•	•	•	•	4,320
Clerks 8 Nos. @ Rs. 93/- p.m. for 2 years			<b>.</b>	•	•	•	•	4	•	17,856
Draftsmen 2 Nos. @ Rs. 200/- p.m. for 2 years	Part I			•	•	•	•	•	•	9,600
Tracers 2 Nos. @ Rs. 104/- p.m. for 2 years	A L		•	•	٠	•	•	•	•	4,992
Daffadar 1 No. @ Rs. 33/· p.m. for 2 years	124			•	•	•	•	•	• •	792
Barakandaz l No. @ Rs. 33/- p.m. for 2 years			1	•	•	٠	•	•	•	792
Peons 8 Nos. @ Rs. 33/· p.m. for 2 years	100	1116		•	•	•	•	•	•	6,322
Khalasis 12 Nos. @ Rs. 33/- p.m. for 2 years	100	1	-	•	•	•	•	•	•	9,504
Dak runners 4 Nos. @ Rs. 33/· p.m. for 2 years	eitha	HT.		•	•	٠	٠	•	•	3,162
	1 0.10	30 Cal							Rs.	1,31,260
Dearness allowance for Officers for 2 years lump a			•	•	٠	•	•	•	•	10,000
Dearness allowance for establishment for 2 years	lump s	sum	٠	•	•	•	•	•	•	50,000
				•						60,000
T. A. for officers for 2 years lump sum										24,000
T. A. for establishment for 2 years lump sum	,		•	:	•	•	•	•	•	32,000
	Ť	•	•	•	•	•	•	•	•	
										56,000
2 % contingen	ıci <del>es</del>		•				•	•	Rs.	3,32,580 6,660
Total Establish	hment	,		٠	٠	•	,	٠	. Rs.	3,39,240
										3,39,240
Grand Total		•			•				Re.	6,64,740
		-	-	-	-	•	٠.	-		2021.20

M. D. MITHAL,
Director, Irrigation and Waterways,
C. W. I. N. O.

Estimate for preliminary surveys and investigations of Irrigation and Hydel Projects in the Province of Coorg, which was originally submitted to Government

## ABSTRACT

					AD	DT'A	AUI	,							
I. WORKS															60,000
II. TOOLS AND PLANT															40,000
III. ESTABLISHMENT															1,24,000
						•	-	-	•	_	•	-	•	Ť	_,,
												Tot	al	. –	2,24,000
					D.	E/D 4	F 7 00							· <del>-</del>	
I. WORKS					D	ETA	ILS								
															Rs.
Surveys															
Surveys of the Reservo					Ra, 2 j	per ac	ere .	•	•	•	•	•	•	•	12,000
Irrigation Area, 10,000		@ as.	8 pei	r acro		•	•	•	•	•	•	•		•	5,000
Property, Surveys, etc.	•	•	•	•	•	•	•	•	•	•	•	•	•	•	3,000
Exploration Work—Equip	ment a	ınd St	aff-												
Drilling, boring etc. 4 s	ites @	Rs. 4	4,000	each											16,000
Staff and other geologic	cal sur	veys													4,000
Temporary Buildings, Gar		•	Huis	etc						•	•	•	•	•	-,***
S. D. O. quarters temp						at Rs	. 2.50	0/-						_	7,500
Ovorseers' Huts (12) @	-				2079	1.0	91						•	•	9,000
Gauge Readors' Huts e					A 34	471	- 4:	4		·	Ť		·		3,500
					THE			0.5		•	•	•	•	٠	
	Tot	al—V	Vorks	•	-83			-	•	•	•	•	•	•	60,000
II. TOOLS AND PLANT		•			ASS			37							
Furniture for Divisions	l and S	3ub-D	ivisio	n Offi	ces				•			•			5,000
Camp furniture '	•	•		•	. 1	9	14					•	•		2,000
Transport vehicle and						123	P. H.	. A.					. •	•	15,000
Instrument Level The	odolite	etc. f	or su	rveys	163					•				•	10,000
Current moters, boats è	to. for	disch	arge i	and of	her o	bserv	ations	Sel.							8,000
	Tot	.) 171	م مام م	and Pl	am4									_	40.000
	106	911	OOLS 8	ma ri	ant _	हरेंग	9 20	3	•	•	•	•	•	•	40,000
III. ESTABLISHMENT															
(a) (1) Pay of Officers															. —
1 Executive Eng								•	٠	•	•	•	•	•	10,800
3 Sub-Divisiona	1 Office	rs for	· 12 m	onthe	@ R	s. 500	0/• <b>p.</b> ¤	a	•	•	•	•	•	•	18,000
	Tota	al												. –	28,800
(2) Pay of Establishmen	ıt														
12 Supervisors for		iths @	a Rs.	150/-	n.m.										21,600
1 Accountant for							·	•	•	•	•	•	•	•	2,460
1 Head clerk for 1			-		•	•	•	•	•	•	•	•	•	•	1,920
8 clerks for 12 mo		_			-	·	·	•	•	•	•	•	•	•	7,680
2 Draftsmen for 1						•	•	•	•	•	•	•	•	•	2,400
2 Tracers for 12 n						•	•	•	•	•	•	•	•	•	1,440
1 Dafadar for 12 1				_		•	•	•	•	•	•	•	•	•	360
2 Barkandazes for				_			•	•	•	•	•	•	•	•	720
8 Peons for 12 mo				•	-	•	•	•	•	•	•	•	•	•	2,880
6 Dak runners for						•	•	•	•	•	•	. •	•	•	2,160
o You Limiting Iol					-	•	•	•	•	•	•	•	•	٠	2,100
	Tota	al—E	stabli	shmer	1t	•	•	•	•	•	•	•	•	•	43,560
- 8														-	-

(3) Dearn 333 Allowance	of Offic	ere	—lur	np su	m			•	•		•			•	4,000
(4) Doarness Allowance,	other a	llo	wanoe	s of I	Establ	ishme	ent—l	ımp s	um			•	•	•	20,000
	Total	l	•	•	•	•	•	•	•	•	•	•	•	• _	24,0000
(5) T. A. of Officers	•			•							•			•	8,400
(6) T. A. of Establishme	ent										•				12,960
(b) Establishment Conting	gencies							•			•		•	•	6,280
	Total	— <b>I</b>	Cstabl	lishme	nt		•		•		•	•	•		1,24,000

M. D. MITHAL,

Director, Irrigation & Waterways, C. W. I. N. C.



### ESTIMATE AS PER INSTRUCTIONS OF AD. HOC COMMITTEE

Estimate for Preliminary Surveys and Investigations in connection with the Irrigation and Hydle Projects in Coorg Province, prepared in accordance with instructions of the Ad-Hoc Committee.

#### ABSTRACT I. WORKS 2,02,460 II. TOOLS AND PLANT 79,500 III. ESTABLISHMENT 1,70,040 TOTAL 4,52,000 DETAILS I. WORKS-(i) Dams and Appurtenant Works Preliminary Expenses 1. Surveys of the reservoir basins by air photography and ground survey and plotting contours at 10'-5' intervals on a scale of 4"=1 mile 10 sq. miles @ Rs. 375/- p.sq. mile 3,750 2. Surveys of the dam sites and weir sites by air photography and ground surveys and plotting on a scale of 32"=1 mile 1,280 acres @ Rs. 4/- per acre. 5,120 3. Geological investigations and foundations of the dam sites and weir sites and of the reservoir basins by boring, core-drilling, making drifts and tunnelling etc. including testing: Kokatahole dam . Konganahole dam 15 Nos. Herangi dam 15 Nos. Lakshmantirtha weir 5 Nos. 50 Nos. 50 Nos. each of 50'-2,500'@ Rs. 20/- per foot. 50,000 4. Soil analysis and burrows surveys for earthen dams including testing L. S. 2,000 (ii) Buildings Temporary buildings 5,000 (iii) Main Canals and Branches (a) Survey of the Commanded areas for alignment of canals Herangi . 7.000 agres Lakshman trtha 3,000 acres 10,000 acres 10,000 acres @ Re. -/9/. per acre 5,525 (b) Misoellaneous Surveys 4,000 (iv) Discharge and Silt Observations (2 years) One boatman and four Khalasies at each discharge site, cost of ropes, discharge rods, boats, floats, gauge, slit sampler and laboratory equipment @ Rs. 5,000/- per site per year 3 sites for 2 years \$30,000 (v) Meleorological Observations, Rain Gauges, temperature, humidity etc., observations lump sum 2,000 (vi) Electrical Load Survey L. S. . 10,000 (vii) Economic and property surveys L.S. 5,000 (viii) Communications L. S . 5,000 (ix) Special Tools and Plant. 1 diamond drill complete with accessories @ Rs. 60,000/- each 60,000

2,02,460

11,000 \$1,98,495

3,975

2,02,460

Testing apparatus and laboratory and workshop equipment for testing

2% contingencies

Total Works

of samples .

II. TOOLS AND PLANTS-										
1. Motor vehicles for survey par	rties .									25,000
Running expenses for 2 years										10,000
2. Scientific instruments										10,000
3. Ordinary tools and plant .						•				3,000
4. Camp equipage	•		•	•	•	•				15,000
5. Office furniture	•			•	•	•				10,000
6. R & C. T. & P	• ,	•	•	•	•	•				5,000
Total	•	•		•	•	•				78,000
2% 90	ontingen	cies		•	•	•				. 1,500
Total	Tools	and P	lant	•	•	•	79,	800		<b>679,5</b> 00
III. ESTABLISHMENT—					•					
1. Pay of Officers:										
Asstt. Engineers 2 @ Rs.	560/- p.	.m. fo	r two	years	•	•	•			26,880
Asstt. Geologist 1 @ Rs.	500/- p.:	m. for	one	year	•	•				6,000
Drill Foreman 1 @ Rs 1,	n.q -\000	n. for	one y	rear						12,000
Total	•			. Salta	250	•			_	44,880
			Ca	rried	forwai	d				2,81,960
2. Pay of Establishment										
Oversoers 8 @ Rs. 240/- p.r	n. for 2 y	Vents				<i>ii</i>			46,080	
Senior Clerks 2 @ Rs.150/.			Pears	Property.					7,200	
Junior Clerks 2 @ Rs. 93/-				AL			•		4,464	
Dafadars 2 @ Rs. 33/- p.ni.	for two	years	100	113		D. •	•		1,584	
Gauge Readers 3 @ Rs. 70/	- p.m. fo	r two	year			7	•		5,040	
Peons 4 @ Rs. 33/- p.m. for	two yes	ırs			1911			• •	3,168	,
Khalasis 8 @ Rs. 33/- p.m.	for two	years	-		• 1		•	• •	6,336	
Chawkidars 2 @ Rs. 33/- p.	m. for t	wo ye	ars 🚃	20			•	• •	1,584	
Dak Runners 2 @ Rs. 33/-	p.m. for	two	years			•	•	• •	1,584	
Total	•		•	•	•	٠	٠		77,040	
3. Dearness Allowance of officer	s .		•				•		4,800	
4. Dearness Allowance of Estab	lishment	•	•				• '	•	20,000	
Total		•	•	•	•	•	•		24,800	
5. T. A. of Officers									8,000	
6. T. A. of Establishment .		·	•	•					12,000	
Total				-			_	· · -	20,000	
Total	•	•	•	•	•	•	• .	· .	1,66,720	
	Igencies	@ 2 9	· ·	•	•	. •	•	• •	3,320	
	Tota	.lE9	tablis	hmen	t:.		•		1,70,040	1,70,040
	Gre	and To	otal						-	4,52,000
Estimate for Ye	or								1948-49	10/0 70
Estimate for 18		tails :	as und	ler)		•	. •	· •	2,20,000	1949-50 · · · · · · · · · · · · · · · · · · ·

Estimate for Freuminary investigations of Irrigation and Hydel Projects in Coorg Province of the year 1948-49 and 1949-50.

												1948-49	1949-80
I. WORKS—													
(i) Dam and Appurtenent F	Vorbe	<b>.</b> —											
Surveys and investig	atio	ns											
I. Survey of basin re	<b>V16</b> 26	oir			•	•	•	•	•	•	•	1,800	1,950
2. Survey of the dan	n sit	te .		•						•		2,560	2,560
3. Geological investi	gatio	ons		•	•	•	•	•	•	•	• .	• •	50,000
4. Soil analysis for e	arth	on dan	١.	•	•	•	•	•	•	•		1,000	1,000
(ii) Buildings						•	•	•	•	•	•	•	
Temporary Buildings				•	•	•	•	•	•	•	•	5,000	••
(iii) Main Canals and bras	nches	_											
(a) Survey of the comme	ande	d area										5,625	
(b) Miscellaneous Survey						•							4,000
(iv) Discharge and silt obs	ervat	ione				•						15,000	15,000
(v) Meteorological observa	tions											2,000	••,000
(vi) Electrical load survey												5,000	5.000
(vii) Economic and property	y sur	veys										2,500	2.500
viii) Communications .							•	•	•	•	•	2,500	2,500
ia) Special tools and plans		•		•	•	• to	15		•	•	•	••	60,000
Testing samples, labor	story	r etc.	•		• 1	1	YI.	July 1		•		11,000	***
Contingencies	•	•	•	•	• \	e e		17.	•	•	•	1.495	2,470
. TOOLS AND PLANT												35,480	1,46,980
II. ESTABLISHMENT		•	•	•	- 19	30			•	•	•	79,500 /	
T. B. I. I.	•	•	•	•	. 1	AT		•	•	•	• _	85,020	<b>85,020</b>
	Gra	ind To	al	•	. [	11.3		٠	•	•	•	2,20,000	2,32,000
					100								
					The state of	17.5	1	40					

सन्दर्भव जवन

(sd) M. D. MITHAL,

Director Irrigation & Waterways

C. W. I. N. C.